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AN
ECONOMIC
IMPACT
OF
THE
TFX
CONTRACT
AWARD
ON
THE
FORT
WORTH
TRADING
AREA

A STUDENT THESIS BY:

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AN ECONOMIC IMPACT OF THE TFX CONTRACT AWARD

ON THE FORT WORTH TRADING AREA

THESIS

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By

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PREFACE

Economic change in small areas is subject to a
complex of forces. Technology creates new product and
service demands and undermines old ones. Specialized
resources attract industries. Major decisions by
national or state authorities, or the vagaries of
international markets, spur or stifle growth. Popu-
lations grow in numbers, in incomes, and in skills;
or perhaps decline as outmigrants seek better economic
alternatives. Initiative on the part of local promo-
tion groups may attract activities that represent
net additions to the national product or perhaps mere
relocations away from other small and less favored
areas.[1]

A small area has a characteristic economic
feature. Besides responding to the broad, general
forces that make for development and fluctuation,
such an area is more often than not peculiarly subject
to stimuli or slowdown by outside forces. Its growth
or decline in a modern market economy is likely to be

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[1]C.P.Blair, Economic Growth Projections for the
Dallas, Fort Worth, and Houston Trading Areas (Austin:
Bureau of Business Research, The University of Texas,
1961), p. 1.

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a somewhat erratic and typically unbalanced response to global, national, regional, and state patterns of which it is a minute and often specialized subpart.[2]

Such an economic entity is the Fort Worth trading area. Such will be the affect and impact to be felt by that community and most probably the entire southwest region of the United States as a result of the TFX contract award.

The writers of this thesis are indebted to James S. Hall, General Dynamics Corporation representative for the Dayton, Ohio office, for providing employment estimates and wage statistics without which the thesis could not have been prepared.

For criticism and suggestions, we are indebted to our advisor, Dr. Herbert R. Kroeker of The Ohio State University, and Mr. Lewis J. Williams of The Ohio State University and Major Roy R. Wood, Jr., Air Force Institute of Technology, as members of the reading committee.

We also wish to convey our appreciation to Mrs. Bette Switalski for her typing of the final manuscript.

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[2]Ibid.

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CHAPTER I

INTRODUCTION

The Problem and its Delimitation

The purpose of this economic base study is to
show the economic impact and anticipated effects on
the Fort Worth, Texas trading area as a result of the
TFX (Tactical Fighter Experimental) military aircraft
contract award to the General Dynamics and Grumman
aircraft corporations. In order to accomplish worth
while results in the limited time available, however,
it was necessary to restrict the problem to measur-
able economic factors directly related to General
Dynamics projected TFX employment and income. Many
factors, which by nature effect the economy of an area,
could not be considered as they either were not measur-
able or could not be realistically related to a single
isolated industrial segment of the economic area
without including all basic industries in the trading
area. While economic base studies normally attempt
to forecast the potential expansion and growth of an
entire economic area based on all conceivable economic
impact factors, the study conducted here was designed

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to forecast expansion and growth in the Fort Worth
trading area only insofar as the economy would be
influenced and effected by the TFX contract award.

No single geographic area is necessarily more
appropriate for a base study than another. General-
ly speaking, however, the larger the area considered,
the more diverse are the characteristics of the area.
In order to conduct a study of the economic impact
to be realized by a community as a result of a large
military contract the size of the TFX award, it was
determined that a metropolitan area would be too
small to adequately reflect the total impact, which
is anticipated to effect more than the immediate
Fort Worth metropolitan community. A trading area
is larger than a metropolitan area which is limited
primarily by commuting and shopping patterns only.
The trading area can be formally and more broadly de-
fined as a district whose boundaries are usually de-
termined by the economical buying or selling which
can be accomplished from a given point of distribution.[1]
In addition to the above, pertinent information and
statistics which had been previously compiled in
Blair's 1959 economic projection study of the Fort
Worth trading area were available upon which to base

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[1]2001 Business Terms and What They Mean (New
York: Alexander Hamilton Institute, 1962), p. 282.

an economic base study. For these two major reasons
the trading area was selected as the economic base
upon which impact conclusions were to be developed.

In delimiting the study to the Fort Worth
trading area, it was felt that a more complete eco-
nomic impact analysis could be made in the limited
research time available. It is true, that the prox-
imity of the Dallas trading area will undoubtedly
exert some influence on the conclusions reached in
this paper. Where possible, these interconnected
Fort Worth - Dallas relationships will be examined
and determinations made with respect to economic
effects on the Fort Worth community. In some in-
stances, therefore, it may be desirable to treat
the Fort Worth and Dallas trading areas as a single,
combined unit. Primarily, however, this study will
be limited to the Fort Worth trading area. All dis-
cussions contained in the paper concerning economic
impact factors and effects can be assumed to refer
only to the Fort Worth trading area unless other trad-
ing areas or metropolitan areas are specifically men-
tioned and included in the discourse.

The TFX contract period selected for analysis
and review has been restricted to the years 1960-1970.
The years 1960 through 1962 are prior to the contract
award but years in which competitive preparation of

aircraft design, cost estimates, etc. were being sub-
mitted by the General Dynamics Corporation and other
aircraft companies interested in making proposals.
For the years 1963-1970, projections of General
Dynamics employment and income at Fort Worth were
made in order to determine what, if any, impact the
TFX contract would have on the Fort Worth trading
area. Since estimates become less accurate when
projecting for a long period of time, it was deter-
mined that no purpose would be served by projecting
figures beyond 1970.

A further delimitation of the study is that
which binds measurement of the economic impact of the
TFX contract award on the Fort Worth trading area to
General Dynamics TFX basic employment, income and
local procurement. All previous employment projec-
tions evolved in 1959 from the Blair study for the
1960-1970 period have been accepted as valid projec-
tion estimates.[2] However, it is the subsequently
revised General Dynamics employment estimates de-
veloped as a result of the TFX contract award that
now increases previous employment projections for
the aircraft and parts basic industry in the Fort
Worth trading area.[3] The projected increase to

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[2]Blair, pp. 74-75.

[3]Interview with James S. Hall, General Dynamics
representative, Dayton, Ohio, June 24, 1963.

General Dynamics employment and employment income by
year as a result of the award is the basis upon which
the TFX economic impact on the Fort Worth economy is
to be determined. All employment projections for all
other basic industry in the trading area will remain
as previously provided, but General Dynamics pro-
jected employment figures will be increased and
varied in accordance with estimated yearly TFX pro-
duction schedules. This will be explained in greater
detail in chapters to follow.

Assumptions

In the conduct of any study of projected area
growth, certain basic assumptions must be made. In
this study of the Fort Worth trading area, various
specific assumptions determined necessary were also
made from time to time relative to the specific data
or subject matter under discussion. The various
specific assumptions will be identified as such in
the body of the paper when applicable and appropriate
for mention or consideration. However, basic assump-
tions applicable to this study in its entirety are
as follows:

1. That national economic conditions will pre-
vail as in the immediate past during the projection
period.

2. That no major war will break out and that the present cold war status will continue indefinitely.

3. That the General Dynamics TFX contract award will remain in effect as currently planned for the entire period of this economic impact projection study (until 1970).

4. That General Dynamics TFX research and development and production will remain in the Fort Worth area at the currently estimated volume for the entire period of the study (until 1970).

5. That no other substantial government or commercial contract is awarded to General Dynamics for performance in the Fort Worth trading area.

6. That all General Dynamic/Fort Worth TFX aircraft and aircraft parts production is considered "basic" employment.

7. That for the purposes of this study, any expansion to Fort Worth economic growth is derived from General Dynamics expansion in "basic" employment as a result of the TFX contract award.

The Economic Base Study

The economic base of a community consists of those activities which provide the basic employment and income on which the rest of the local economy depends. An economic base study identifies the basic sources of employment and income and provides

an understanding of the source and level of all
employment and income in a community. The pri-
mary objective of an economic base study is to
develop information which will help a community
solve local problems, make better decisions
about matters that will enlarge economic oppor-
tunities for its citizens, improve their welfare,
and make it possible for them to increase their
contributions to community and national growth.

Economic base studies divide the local
economy into two segments:

1. Firms and individuals serving markets out-
side the community.

2. Firms and individuals serving markets
within the community.
The goods and services which the community sells
outside its boundaries are considered exports.
Exports include all sales made outside the community,
not just trade with foreign nations. The remaining
goods and services go to the local market. Local is
defined to mean the geographic region being studied,
such as the Fort Worth trading area.

Implicit in this division of markets is the cause
and effect relationship. Export markets are consider-
ed the prime mover of the local economy. If employ-
ment serving this market rises or falls, employment
serving the local market is presumed to move in the

same direction. When the factory (export) closes,
retail merchants (local) feel the impact as laid-off
factory workers have less to spend. Because of this
prime mover role, export employment is considered as
"basic". Employment which serves the local market
is considered adaptive and is titled "dependent" or
"service" employment.

One important use of a base study is in making
some kind of forecast, although a forecast is not
necessarily part of a base study. When the economic
forces which have made the community what it is are
understood, it is easier to project how these and
other economic forces will effect the community in
the future. First, the growth or decline of employ-
ment in basic industries is forecast for some time
period. Then associated non-basic employment growth
or decline can be determined. These projections can
help greatly in forecasting changes in population,
income, and the tax base. Forecasts of trends in
these fields, in turn, can be used in planning to
meet a wide range of public and private needs of the
area, such as planning and zoning, capital budgeting,
taxes and expenditures, housing, transportation, elec-
tricity, gas, telephone, and other services.[4]

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[4]Charles M. Tiebout, The Community Economic Base
Study (New York: Committee for Economic Development,
1962), pp. 9 and 13.

Methodology: The Economic Base or Export Model

The model used in this study for projecting
employment and population growth in the Fort Worth
trading area is one of a type known as an "economic
base" or "export" model. It rests on two basic
assumptions:

1. That population change in small areas is
primarily a function of economic activity, with
natural population change (births and deaths) playing
a role secondary to the effects of net migration. If
employment opportunities continue to be created, an
area may contain its natural population increase and
draw-in additional people from the outside, while
emigration and population decline will occur if better
opportunities exist elsewhere.

2. That a meaningful distinction can be drawn
between those activities located in a small area but
oriented toward outside markets, e. g. military air-
craft production and those activities strictly serv-
ing local demand. The former are presumed to be the
dynamic element in economic change within the area.
They bring in outside income, which when respent pro-
duces a multiplier effect supporting incomes and
employment in other activities.

Military aircraft production is considered an
"export" activity and is termed "basic" industry in

this study, in contrast to the "dependent" business activities which serve local area markets only. The term "export" model is appropriate since sales outside of the area are considered to be the originating force in expansions or contractions within the area. The "dependent" business activities are viewed as changes in response to net changes in income derived from "basic" business activity. Thus, the "exports" of the market area provide the clue to growth or decline.[5]

The growth model employed depends upon the development of direct relationships between levels of dependent and basic activities, expressed in terms of employment. Employment is normally chosen as the data media for the model because it is relatively easy to obtain, while on the other hand, detailed income data by industrial origin, which is perhaps more desirable for multiplier analysis, is not always available for small areas.[6] In this study an attempt has been made to weight General Dynamics current employment figures with current wage rates, and to apply estimated wage rates toward projected future employment totals. In other words, by estimating employment totals and wage rates by job classification at General Dynamics/Fort

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[5]Blair, p. 9.

[6]Ibid., p. 10.

Worth for yearly periods up to the year 1970, it is anticipated that gross income and, thence, disposable income figures can be derived. If realistically estimated, the number of General Dynamics workers and their average wage can indicate how many new dependent-type jobs could be created and supported through application of the service-basic ratio and, coupled with the multiplier effect principle, an indication of the economic impact resulting from the TFX contract award on the Fort Worth economy can be shown. Because of the service-basic ratio, the most critical part of any procedure is the accurate identification and projection of future basic employment. In this study, this means an accurate projection of General Dynamics/Fort Worth employment. Increased basic employment tends to expand dependent employment by a multiple of the amount of basic employment change as indicated by the service-basic industry ratio comparison. In some high-income industries each basic employee may support three or four dependent employees in local-market service (dependent) activities.[7]

History and Economic Characteristics of the Fort Worth Trading Area

Fort Worth, which is the hub of the entire trading area, is in North Central Texas, only 30 miles

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[7]Alfred G. Dale, An Economic Method for Small Areas (Austin: Bureau of Business Research, The University of Texas, 1955), pp. 33-34.

west of Dallas. The distance between the spreading

outskirts of the two cities is much shorter. The 1960

census shows a population of 538,495 for Fort Worth.

This is an increase over the 1950 census of some 49

percent.[8] The estimated population for the entire

Fort Worth trading area for 1960 is 710,900.[9] In its

century of existence, the city has passed through

several stages of growth to become the currently

diversified metropolis that it is. In the 19th

century, Fort Worth was a railhead and market center

for the cattle country of West Texas. In 1903, the

city successfully subsidized the establishment of two

large meat packing houses. With these facilities,

it rapidly became one of the nation's largest cattle

and sheep markets, and remains so today.[10]

Beginning in the First World War, major oil

discoveries were made in nearby counties. As the

nearest urban center of any size, Fort Worth became

the focus for the resulting rapid development. Much

of the financing, administration, and supplying of

the West Texas fields emanated from Fort Worth. In

return, oil flowed to the city for refining. Fort

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[8]Donald J. Bogue and Calvin L. Beale, Economic
Areas of the United States (New York: The Free Press
of Glencoe, Inc., 1961), p. 1057.

[9]Blair, p. 75.

[10]Bogue and Beale, p. 1057.

Worth lost some of its importance in the industry subsequently as the closest fields were depleted and as West Texas created cities of its own. There is still one sizeable refinery, however, and certain items of oil industry equipment are manufactured in the city. Moreover, the oil boom brought in wealth and capital that stimulated other business ventures.[11]

In 1941, the industry of the area took a new direction when a huge military aircraft plant was acquired by the General Dynamics Corporation. Since that date, aircraft manufacture has been the major payroll in the area, for the plant proved to be permanent and has been joined more recently by a helicopter factory. In the same period, the growing city and its newly skilled labor force attracted producers of automobiles (assembly), air conditioners, containers, and clothing. In short, the manufacturing base of the economy has been greatly expanded.[12]

Twelve counties comprise the Fort Worth trading area, as shown in Figure 1. These twelve counties have been determined through a series of surveys conducted by the Texas State Employment Commission and other state agencies, to be dependent mostly on the

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[11] Ibid., p. 1058

[12] Ibid.

city of Fort Worth for their spending and buying of needed goods and services.[13] The economy of the trading area is obviously dominated by the industrial and commercial development of Fort Worth and Tarrant County, where the bulk of industrial expansion has occurred. Much of the evolution of the rest of the trading area has occurred in response to changes within the Fort Worth metropolitan area. It is expected that industrial expansion will continue to concentrate on the Tarrant County complex, with subsidiary developments in the remainder of the trading area.[14]

In spite of the rapid industrialization of the eastern section of the Fort Worth trading area, agriculture and petroleum production are still important elements in the economic base. It is probable that significant declines in agriculture employment will occur during the 1960-1970 period under study, particularly in the western counties of the trading area. However, dairying and production of truck crops and specialized crops should increase in response to the growth of urban markets in the trading area. Petroleum industry employment, meanwhile, is expected to decline gradually during this period.[15]

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[13]Blair, p. 56

[14]Ibid.

[15]Ibid.

Figure 1

FORT WORTH TRADING AREA
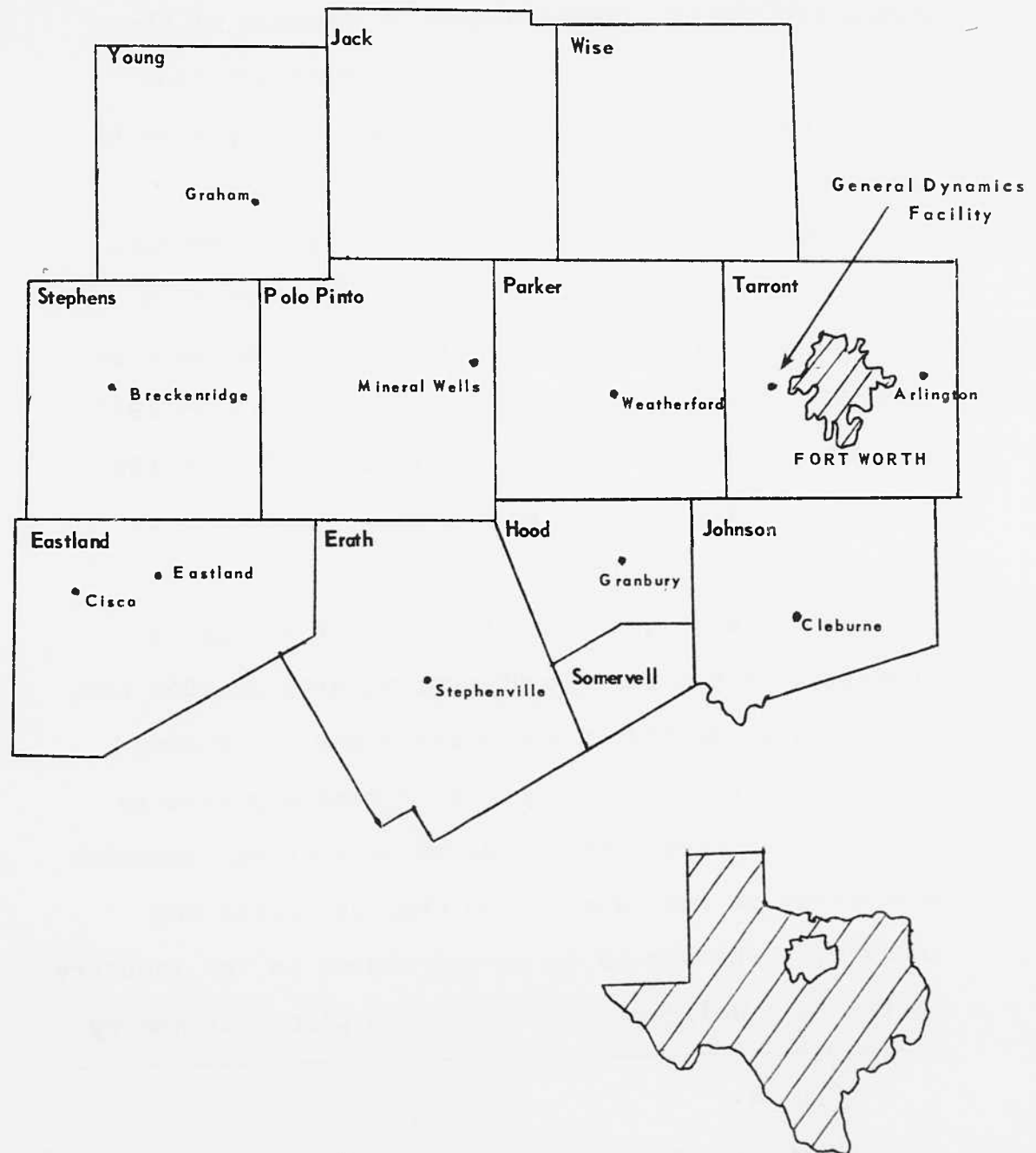
Employment in manufacturing has a good growth potential, and basic services should expand rapidly. Prior to the TFX contract award, the traditional airframe industry was expected to offer drastically reduced employment opportunities.[16] Because of the contract award, however, projected manufacturing growth rates will be larger than would otherwise be the case.

The population of the trading area grew substantially from 416,000 in 1940 to approximately 711,000 in 1960.[17] It is projected on the basis of economic growth potentials to reach 778,000 by 1970, 857,000 by 1980, and 1,090,000 by 2020.[18] The 1960 Fort Worth trading area population, by county, is shown in Table 1 below.

Total employment in the aircraft and parts industry for the Fort Worth trading area in 1959 was estimated at 22,962 in the Blair study. The same study also reveals that General Dynamics presently accounts for approximately 80 percent of all aircraft employment in Fort Worth, and thus dominates the industry. The second largest producer in the industry is the Bell Helicopter Company with plants at nearby

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[16]Ibid.

[17]Ibid., pp. 74-75.

[18]Ibid., pp. 75 and 77.

Hurst and Saginaw. Other important firms are

Menasco Manufacturing Company, makers of aircraft

landing gear and missile components, and Aero-

affiliates and Stratoflex, each of whom devotes part

of its employment to the manufacture of aircraft

parts. Nine other small firms in and around Fort

Worth, and one each at nearby Cleburne and Olney

also manufacture aircraft parts.[19]

TABLE 1

1960 POPULATION BY COUNTY
IN THE FORT WORTH TRADING AREA[a]

County	Population
Eastland	19,500
Erath	16,200
Hood	5,400
Jack	7,400
Johnson	34,700
Parker	22,900
Palo Pinto	20,500
Somervell	2,600
Stephens	8,900
Tarrant	538,500
Wise	17,000
Young	17,300
Fort Worth trading area (total)	710,900

[a]Figures obtained from The World Almanac and
Book of Facts for 1963. U. S. Population by States
and Counties, pp. 294-295.

Prior to the TFX contract award, employment in

the aircraft and parts industry for the Fort Worth

trading area had been projected downward to 19,000 by

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[19]Ibid., p. 64.

1970, to 15,000 by 1980, and to 10,000 by 2020.[20]
Revised estimates now place potential aircraft and
parts employment at a high of 28,900 for 1968; only
slightly lower at 26,700 for 1970.[21]

Had it not been for the TFX contract award,
the decline in projected aircraft industry employ-
ment would have had an adverse effect on the Fort
Worth economy. This is especially obvious when it
is noted that in 1959 employment in aircraft and
parts manufacturing was approximately 43 percent of
all manufacturing industry and 24 percent of all
basic industry employment for the entire Fort Worth
trading area. In other words, almost half of all
persons engaged in manufacturing type employment
were working in the aircraft and parts industry. One
out of every four basic industry workers was employed
in the aircraft and parts industry.[22]

Summary

This introductory chapter has delimited the TFX
impact problem to be researched, and touched on the
economic base or export model approach to be used to
project Fort Worth TFX employment and income for the

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[20]Ibid., pp. 75 and 77.

[21]Interview with James S. Hall, General Dynamics
representative, Dayton, Ohio, June 24, 1963.

[22]Blair, p. 65.

1960-1970 period to be studied. A definition has

been given of what a trading area is and why it was

selected as the geographic limitation to the study.

A further limitation is that which restricts the

study to General Dynamics employment, employment

income, and General Dynamics local procurement, since

it is assumed that General Dynamics will perform the

only substantial or measurable portion of the TFX

contract in the Fort Worth area. The several as-

sumptions made in order to establish a static economic

and political climate for the projected 1960-1970

study period, limits further those possible economic

variables that might otherwise be considered in the

study.

A description was given of what an economic

base study is and how it is expected to develop infor-

mation which will help a community solve local problems

and forecast private and public needs of the area.

To give the reader a feel for the Fort Worth trading

area, some of its history and its current and pro-

jected economic characteristics were provided. A

better understanding of the Fort Worth trading area

can be had from the geographic and population figures

and data given.

Following chapters will go into detail to

describe the significance of the service-basic ratio,

differentiate between basic and dependent (service) employment, and explain the multiplier doctrine, accelerator principle, and income leakage factors, all of which will effect the economic impact to be felt by the Fort Worth trading area as a result of the TFX contract award.

CHAPTER II

GENERAL DYNAMICS CORPORATION AND THE TFX CONTRACT

Business Position

General Dynamics is one of the leading contractors of modern weapon systems and is also well represented in such varied fields as nuclear submarines and other atomic power activities, the space sciences, electronics, and construction materials. Huge write-offs against commercial jet transport programs produced heavy deficits in 1960 and 1961, and lower sales and profits were indicated for 1963 as a result of the termination of the B58 supersonic aircraft project and the completion of the Atlas missile base activation programs during the latter part of 1962. However, the company's successful bid to develop the advanced TFX aircraft should become a major asset in the years ahead.[1]

Plant and Property

General Dynamics/Fort Worth is located on 600 acres of land and has buildings containing 4,700,000

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[1]Standard Listed Stock Reports (New York: Standard and Poor's Corporation, 1963), XXX, No. 109, Sec. 13.

square feet of floor space. Of this figure 19,000 square feet of space is used for engineering offices. The plant, including machinery and equipment, is leased from the United States Government. Plant facilities are designed for production of long range multiple engine aircraft as well as lighter aircraft. Because General Dynamics/Fort Worth occupies a U. S. Government owned plant it has, since 1957, not been subject to local taxes.[2]

Financial Condition

Revenues for 1962 were down 8 percent from the previous year reflecting the phase out of the B58 bomber program and lower commercial plane sales. Margins were restored, however, as virtually all expenses related to the jet transport projects were absorbed in prior years. Operating income for 1962 was $103,018,241 compared with an operating deficit of $126,046,162 in the previous year. Pretax profits were $58,843,460 as against a pretax loss of $168,066,854 the year before. After taxes at 9.6 percent, net income was $52,858,645 in contrast to the huge final deficit of $143,203,459 sustained in 1961.[3]

[2]Moody's Industrial Manual (New York: Moody's Investment Service, Inc., 1962), p. 1802.

[3]Standard Listed Stock Reports, XXX, No. 109, Sec. 13.

Employment

General Dynamics/Fort Worth employment figures
have been dropping since 1957 due to the completion
and phase out of the B58 bomber program. From a
recent 1957 high of 25,399, employment was down to
less than 16,000 by 1962. With the TFX contract
award General Dynamics expects that employment will
gradually increase until a peak is reached of ap-
proximately 25,000 by 1968.[4]

The Origin and Purpose of the TFX Contract

The idea of a new fighter plane for the U. S.
Air Force came into being in 1959 when General F. F.
Everest, the incoming commander of the Air Force's
Tactical Air Command, determined the need for a new
fighter-bomber that would meet the demanding require-
ments for the next decade.

The type of plane that General Everest had in
mind was entirely different from those presently in
the Air Force inventory. The best fighter that the
Air Force had at the time was the F-105, which was in
a vulnerable position with only forty-four suitable
take-off and landing fields, and these fields were
well known by the Soviets. General Everest had in mind

[4]Interview with James S. Hall, General Dynamics
representative, Dayton, Ohio, June 24, 1963.

a new fighter, an aircraft with the capability to
use shorter runways and any type of landing field.
He also wanted the capability of long range for
ferrying purposes in order to arrive at trouble
spots in a minimum of time. The new plane, according
to Richard Smith writing for Fortune Magazine, should
also have the capability of low-level attack at super-
sonic speeds, be able to loiter at subsonic speeds
for reconnaissance purposes, and participate in aerial
combat at speeds up to 1,700 miles per hour.[5] This
radical approach requiring multi-operational charac-
teristics in one airplane was to have a profound
effect in future aircraft production and procurement.

The Department of Defense Views on Procurement Policies

When Secretary of Defense Robert S. McNamara
came into office in 1961, he began to place more
emphasis on "value engineering" in the procurement
system of all military services. He felt that inter-
service rivalry and procurement by single services
should be carefully considered. It was his firm
belief that the Department of Defense should review
all procurement from an objective point of view and
thereby make sound decisions unencumbered by service
bias or prejudice. He felt that by looking at defense

[5]Richard Austin Smith, "The $7-Billion Contract
That Changed the Rules," Fortune, LXVII, No. 3 (March
1963), p. 97.

spending from top-level echelons in the Department of Defense, civilian specialists could view competitive bidding on a more objective basis than could the individual services. Under this concept, Secretary McNamara felt that his department could save the nation millions of dollars by coordinating its procurement.

With the advent of the TFX, he felt that this was the opportunity to which he could apply the various approaches which he believed would save the nation a vast amount of money and at the same time streamline the procurement system for all military departments. The TFX would be the biggest fighter-plane program since World War II, involving most of the major aircraft industries in the bidding phase, requiring a radical departure from previous concepts of production and design, and creating a multi-purpose airplane for both the Air Force and the Navy.

Extent of the Contract

In April, 1960, according to Smith, a joint conference of the Air Research and Development Command, the Tactical Air Command, and NASA had agreed on a program for the TFX. Assuming that a contract would be let in October, 1960, sixteen test aircraft would be produced for $338 million, first flight test in May, 1963, date of operational availability in October, 1965,

and total cost of contract would be approximately
$2.2 billion.[6]

Due to the forthcoming Presidential election
in November, 1960, the Department of Defense tempo-
rarily postponed all procurement action concerning
the awarding of the TFX contract since the incumbent
administration did not want to commit the incoming
administration to costly, far-reaching new military
programs.

After Robert S. McNamara took over as the
Secretary of Defense, it was months before he got
around to reviewing the TFX, but when he did, he
saw the opportunity to apply his ideas about "con-
trolled response," i.e., that our arsenal should
contain a number of options to all-out nuclear war,
one of which was the selective, tactical use of atomic
weapons. The TFX, as he saw it, would be able to fly
under enemy radar at speeds too great for foreseeable
ground-to-air missiles. Second, with a plane of such
versatility, McNamara decided that this weapon could
fill the needs of all the military services and, as
the first fighter designed for multi-service require-
ments, it would thus become the cornerstone of his
efforts to cut costs.

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[6]Ibid., p. 182.

Richard Smith described McNamara's first official

action concerning the TFX in the following manner:

> McNamara's October 1, 1961 Request for Pro-
> posal and the accompanying Work Statement
> signaled the official start of the great
> race. The finish line for TFX designs was
> set for December 6, nine and a half weeks
> away. Crammed into 250 pages of the Work
> Statement were the rigorous requirements:
> the expected performance, the logistics and
> support demands, and the type of environment
> the aircraft would have to function in.
> Each contractor was required to specify how
> he intended to make the plane, which of the
> three eligible engines he would use, the
> costs involved, the dates on which he would
> guarantee to reach such milestones as first
> flight and operational availability, how
> much subcontracting there would be and to
> whom, and so on ad infinitum, even to the
> names of the top people to be assigned to
> the job.[7]

After receipt of initial bids, Secretary McNamara

was concerned about the low-cost estimates in the bid

proposals. He felt that both General Dynamics and

Boeing had submitted bids that were extremely low

with the idea that they would raise the costs after

the contract had been awarded. In view of the fact

that a cost overrun on a $7-billion program would

involve a huge sum of money, he felt this would have

to be borne by the taxpayers and the total amount could

have been used toward a different weapon system.[8] As

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[7]Ibid.

[8]Interview with Deputy Director, SPO for the TFX,
June 11, 1963, revealed that no cost figures, numbers
of aircraft, production schedules, or conditions of the
TFX contract would be released. The data used in this
thesis were obtained from magazine sources and are not
considered official.

previously mentioned, the original program called for
the building of sixteen test TFX aircraft at a cost
of $338 million and an undisclosed number of operational
aircraft at a total cost of around $2.2 billion. Under
McNamara's plan, the new revised bid proposals called
for a larger number of TFX aircraft than originally
planned for when the Air Force would have been the
sole user. The total cost of this new program would
cost approximately $7-billion since the plane was now
for multi-service use.

Besides cost considerations, McNamara was keenly
concerned about the commonality of parts for the new
weapon system that was to be used jointly by the Air
Force and Navy. Past experience had shown that the
aircraft industries were service-oriented and had
previously built their planes to please the individual
services. Other than General Dynamics, the other
major aircraft companies still felt this would be the
concept for TFX production. This idea proved to be a
stumbling block for Boeing when it came to making a
final decision on contract award, since McNamara had
decidedly emphasized his desire for more commonality
in the new weapon system.

When the Source Selection Board met in December,
1961, to consider the Requests for Proposal from the
bidders, it took them a month to evaluate and make
their recommendation to award the contract to Boeing.

Upon review by the Department of Defense, it was decided that both Boeing and General Dynamics should refine their designs and resubmit their proposals.

In May, 1962, the Source Selection Board made their second evaluation and again recommended Boeing. This time the Navy expressed fears that the designs would not fulfill its needs. Both contractors were directed to rework their designs again.

The third evaluation was made by the Source Selection Board on June 20, 1962, and again Boeing was recommended. By this time an estimated 200,000 manhours had been put into the three evaluations on the proposals for the F-111 (TFX) tactical fighter. In June, 1962, Secretary of the Air Force Zuckert wrote the Source Selection Board directing them to hold a fourth evaluation and reconsider design and cost estimates. On November 2, 1962, the fourth evaluation was completed by the Source Selection Board and, again, Boeing was recommended.[9]

The decision to award the TFX contract to General Dynamics/Fort Worth was made in November, 1962, by the Department of Defense. Design was no longer a factor in deciding the contract award.

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[9]George C. Wilson, "TFX Board Selected Boeing Four Times," Aviation Week & Space Technology, Vol 78, No. 9 (March 4, 1963), p. 24.

Secretaries McNamara, Gilpatric, Zuckert, and Air Force Under Secretary Joseph Charynk evaluated the proposals on the basis of commonality, schedule, and cost estimates. Under this criteria, all Secretaries agreed that the award should go to the General Dynamics combine.

The world of defense procurement, according to Smith, has only begun to feel the impact of the TFX contract. Nine airframe companies and three engine manufacturers were initially involved in bidding on the multi-service airplane, before Boeing and General Dynamics/Fort Worth were selected for final competition of the contract award. When it was over, General Dynamics/Fort Worth had won the contract for producing the airframe (expected to reach a total of $4.2 billion by 1970). Pratt & Whitney had a potential billion-dollar contract for the engines, and a new concept of weapon procurement evolved from the Department of Defense.[10]

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[10]Smith, _Fortune_, LXVII, p. 96.

CHAPTER III

BASIC - DEPENDENT INDUSTRY RELATIONSHIP

Perspective

It is necessary at this point to make some sim-
plifying assumptions and observations in order to
clearly identify and differentiate between basic and
dependent (service) industry. Much of the following
to be discussed and covered in this research study
will involve basic and/or dependent employment and
income, and for this reason a definitive identifi-
cation should be made between the two.

In order to interpret assembled data and to
arrive at concrete conclusions regarding the rela-
tive importance of various economic factors, it is
essential to establish a clear frame of reference.
It is apparent that some types of economic activity
are more important than others, so far as the via-
bility of the local economy is concerned. Under
certain circumstances the size of an industry or
activity, measured in terms of employment or in the
money values of the product or services it offers,

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may not necessarily correlate with its ability to influence total economic development.[1]

If well defined economic trends are present within the trading area, it is possible to make some assumptions regarding their future impact on the local economy. Any type of developing economic activity is apt to generate its own impetus for continued development. Its localization in an area or region carries some expectation of further development and of activities subsidiary to it. In Texas a good example of this principle is to be found in the development of the aircraft and automobile assembly industries in the Dallas - Fort Worth areas. The creation of a trained labor force in this combined trading area, together with its strategic marketing advantages, has made it increasingly attractive as a site for similar industries. At the same time, a series of subsidiary activities (e.g. sub-contracting) have developed in response to the marketing opportunities offered by the major industries. There is also, of course, the resultant subsidiary growth of the supporting service industries.[2]

Basic Industry

The purpose of an economic analysis which is directed to finding how a community may grow, or

[1]Dale, p. 8.

[2]Ibid., p. 10.

whether it can grow, must primarily consider those
activities with a growth potential deriving from
factors external to purely local influences. Such
types of activity, which are based primarily on the
sale of goods and services outside the local area or
which are supported from non-local revenue sources,
are considered to be "basic" industry.[3] In this
context the TFX aircraft can be considered wholly as
an "export" product - a product produced for external
consumption and supported from non-local revenue.
The aircraft and aircraft parts industry can there-
fore be thought of as "basic" industry.

Unlike service activities, the capacity for
growth of basic industry is not restricted by local
demand or income levels. This characteristic gives
basic industry a dual importance in the local economy.
Its capacity for expansion is not limited by the local
economy, and yet this expansion also generates con-
comitant secondary growth in the local service indus-
tries.[4]

Expanded opportunities in basic activities
attract labor to a community. Augmented population

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[3]Ibid., p. 9.

[4]Ibid.

and wealth in turn support expansion in the service industries. As employment in the basic industries increases, there will invariably be increases in employment in the service industries. In a very real sense, therefore, basic industry should be regarded as the foundation of community and area growth and prosperity.[5]

In order to isolate basic from service activities, it is necessary to adhere to the following basic industry criteria:

1. That the goods and services produced, or at least part of the production, are exported from the area or are bought by non-local users.[6]

2. That the revenue received is from non-local sources of income. This will apply to locally situated enterprises whose revenue is received from non-local sources.

3. That local residents who work outside the study area should be considered as basic workers, since they are responsible for bringing outside income into the area.[7]

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[5]Ibid.

[6]Ibid.

[7]Ibid., p. 31.

Dependent (Service) Industry

To accurately define or identify dependent (service) industry is to determine whether or not the products made or services offered are oriented to the local market and are consumed locally. Two characteristics of dependent type industry activity are that:

1. The level of activity in business geared to serving the needs of the local population is related to the total amount of wealth available in the community.[8]

2. Increasing the scope of this type of business will not augment the total wealth of the community. It might create different internal economic relationships, but it cannot create more wealth since it is dependent in the first instance upon the existing wealth in the area.[9]

It is entirely possible that the absolute importance of service type activity measured either in terms of employment or in dollar business volumes, will be dominant in the economic community. In fact, in many communities, a majority of the population relies upon opportunities in the service trades for employment. In the long run, however, service

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[8]Ibid., p. 8.

[9]Ibid.

industry is essentially a dependent activity; dependent upon basic industry activity.

It is clear, for example, that the amount of laundry business which can be independently sustained in a community is closely related to the size of the local population, local income levels, and local social habits. Within fairly narrow limits there will be an upper level of laundry activity which can be economically supported. Any attempt to increase the amount of laundry business in a community which already has its needs adequately covered would result in a redistribution of the existing business, rather than an increase in the total amount.[10]

In this research study, activities will be termed and referred to as "service" and "dependent" industry interchangeably, and accordingly can be synonymously identified. Essentially, however, when related directly to basic industry, the term "dependent" industry will most likely be used. The term "service" industry will be more often used when referring to population and community activities apart from direct connection or reference to basic industry.

Basic-Dependent (Service) Industry Interrelationship

It is expected that some industries will always be partly basic and partly service in character to

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[10]Ibid.

the extent that some of its products or services are
exported and some retained for local consumption.
When this is the case, it is necessary to determine
the approximate proportions of the basic and service
components.[11]

The first step is to divide the employment in
each of the basic industries in the ratio of the
amount of non-local to local business, in order to
arrive at an estimated figure representing the amount
of "basic employment" within each industry. For the
estimates to be realistic, it would be necessary to
survey each individual establishment in the trading
area, determine the proportions of output oriented
to outside markets, and allocate an appropriate
amount of employment as basic, with the remainder
being regarded as dependent.[12]

In the conduct of this study of the TFX impact
on the Fort Worth trading area, the suggested survey
procedure is not practical or necessary since it has
already been assumed that all TFX production is for
export and supported from non-local revenue sources
and therefore, no portion of production can be con-
sidered dependent or service employment.

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[11]Ibid., p. 31.

[12]Blair, pp. 10-11.

CHAPTER IV

PROJECTED FORT WORTH TRADING AREA
TFX EMPLOYMENT AND INCOME

Prospective

In this chapter, attempts will be made to de-
velop from historical data, projected General Dy-
namics TFX basic employment and from that, derive
TFX dependent employment in the Fort Worth trading
area. The projection period to which this study
is limited begins in 1960 and extends through 1970.
During this period, a year to year projection of
TFX basic employment will be made and the service-
basic ratio applied to determine dependent employ-
ment.

Estimated basic and dependent workers' wages
for the years to be covered will also be projected
on the basis of historical information. The total
TFX basic and dependent employment derived from pro-
jected estimates will be multiplied, as applicable,
by the projected Fort Worth average weighted workers'
wage in the aircraft and parts industry on the one
hand, or by Fort Worth dependent industry average
weighted workers wage on the other hand, to arrive
at TFX Fort Worth gross employment income.

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The breakout of basic gross employment income
and dependent gross employment income for each year
covered by the study will be adjusted to account for
personal Federal income and social security taxes in
order to derive disposable income. Resulting basic
and dependent disposable employment income figures
will be determined by year and related to the TFX
contract award. Chapters to follow will be concerned
with determining what portion of disposable income
will be spent in the Fort Worth trading area and
what multiple effect will be exerted on the Fort Worth
economy.

General Dynamics TFX Basic Employment

In order to estimate the amount of General Dy-
namics/Fort Worth TFX employment for the years 1960
through 1970, it was first necessary to make use of
employment projections previously derived in a study
conducted in 1959 by the Bureau of Business Research,
The University of Texas.[1] In the study, projections

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[1]Blair, p. 74-75. There are many approaches to
conducting a limited economic area base study. In
this instance, it is not specifically known what
methodology was followed by C. J. Blair and the Bureau
of Business Research staff, but it is assumed that the
pamphlet, An Economic Survey Method for Small Areas
prepared previously by the Bureau of Business Research,
was used as a guide. Much of the information obtained
by the Business Research staff for their study came
from the Texas Employment Commission, U. S. Census
Bureau, other U. S. and State government agencies, and
through correspondence and interviews with firms and
persons engaged in, or concerned with, business and
commerce in the Fort Worth trading area.

of total basic employment and projections of basic
employment in the aircraft and parts industry for
the Fort Worth area were made for the years 1960 and
1970, and beyond. Based on the figures provided for
1960 and 1970, an interpolation was made to arrive at
projected employment totals for each of the interven-
ing years. The interpolated results indicated in
Table 2 show that total basic employment in the trad-
ing area was increasing while aircraft and parts
employment was decreasing. This was mainly due to
manufacturing and other basic industries increasing
their employment more than the anticipated employment
decline in aircraft and parts. These statistical pro-
jections were compiled, of course, prior to the TFX
contract award.

In 1959, some 80 percent of all aircraft and
parts industry production workers in the Fort Worth
area were employed by the General Dynamics Corporation.[2]
For the purpose of this research study, it has been
assumed that prior to consideration of TFX impact
factors, projected employment in the aircraft and parts
industry would continue to be provided by General Dy-
namics at the 1959 prevailing rate of 80 percent for
the projected 1960-1970 period. The remaining 20
percent would be aircraft and parts workers employed

[2]Blair, p. 64.

Part A Projected employment prior to TFX contract	1960	1961	1962
Total basic employment[a]	99,377	99,687	99,997
Total AC & parts employees	22,583	22,204	21,825
Gen. Dynamics Employees (80%)	18,066	17,763	17,460
All other employees (20%)	4,517	4,441	4,365
Part B Projected employment subsequent to TFX contract			
Total basic employment	99,377	99,687	99,997
Total AC & parts employees	22,583	22,204	21,825
General Dynamics employees	18,066	17,763	17,460
(percentage)	80%	80%	80%
All other employees	4,517	4,441	4,365
(percentage)	20%	20%	20%
General Dynamics TFX Employment Percent of total General Dynamics employment	1%	2%	5%
Number of employees	181	355	873

[a]Total basic employment figures for the years between 1960

1

TABLE 2

CTED TFX BASIC EMPLOYMENT, FORT WORTH TRADING AREA

1962	1963	1964	1965	1966	1967	1968	1969	1970
99,997	100,307	100,617	100,927	101,237	101,547	101,857	102,167	102,479
21,825	21,446	21,067	20,688	20,309	19,930	19,551	19,172	18,791
17,460	17,157	16,853	16,550	16,247	15,994	15,640	15,338	15,033
4,365	4,289	4,214	4,138	4,062	3,986	3,911	3.834	3.758
99,997	101,150	103,764	106,377	107,990	109,553	111,217	110,829	110,446
21,825	22,289	24,214	26,138	27,062	27,986	28,911	27,834	26,758
17,460	18,000	20,000	22,000	23,000	24,000	25,000	24,000	23,000
80%	81%	83%	84%	85%	86%	86%	86%	86%
4,365	4,289	4,214	4,138	4,062	3,986	3,911	3,834	3,758
20%	19%	17%	16%	15%	14%	14%	14%	14%
5%	24%	52%	74%	76%	78%	80%	78%	76%
873	4,320	10,400	16,280	17,480	18,720	20,000	18,720	17,480

etween 1960-1970 are interpolated on a straight line basis.

2

by all other aircraft and parts manufacturers in the
area. As already explained, and as shown in Part A
of Table 2, General Dynamics projected employment
figures for the years 1960 through 1970 are based on
data available prior to the TFX contract award.

Subsequent to the TFX contract award, informa-
tion was obtained from General Dynamics in a series
of discussions which indicated actual employment
totals for 1960-1962, and estimated employment totals
for their Fort Worth facility for the years 1963-1970.[3]
The rough employment estimates for 1963 through 1970
were based on the assumption that no drastic changes
would be made to currently planned TFX production
schedules. Based on these estimates it will be noted,
in Part B of Table 2, that a peak employment figure
of 25,000 is projected for General Dynamics in 1968.
From the 1968 employment projection it will be further
noted that General Dynamics will be credited with 86
percent of all projected Fort Worth aircraft and parts
industry employment for that year.

Except for General Dynamics projected employment,
all other aircraft and parts industry employment is
assumed to continue to decline at the previously pro-
jected rates. The basis for this assumption is that

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[3]Interview with James S. Hall, General Dynamics
representative, Dayton, Ohio, June 24, 1963.

Bell Helicopter and the other smaller aircraft and parts manufacturers in the area have been primarily concerned with helicopter and missile work which is not readily conducive to conversion to TFX jet aircraft sub-assembly and part production. Further, indications are that the Fort Worth area in having received the rich TFX "plum" will not be favorably considered for additional TFX sub-contracting. Even if the above is incorrectly assumed, expansion of the smaller aircraft manufacturers due to TFX work would not be of a size to appreciably effect the economy of the trading area. Therefore in order to isolate the economic impact of the TFX contract award on the Fort Worth area, only General Dynamics employment projections have been considered in the study.

In further conversations with Mr. James Hall of General Dynamics, estimates were made as to what percentage of total General Dynamics employees for the years 1960 through 1962, and the percentage of projected employment for the years 1963 through 1970, were, or would be engaged in TFX aircraft development and production.[4] These estimated projections are given in Table 2. From these figures it will be seen that 1968 is forecast as the highest projected year of TFX employment. From these employment figures

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[4]Ibid.

will be determined TFX dependent employment. De-
pendent employment will be discussed at some length
later in this chapter.

General Dynamics TFX Employment Income

Now that General Dynamics TFX projected employ-
ment figures have been developed for the period under
study, the next step is to apply the average weighted
General Dynamics workers' wage in order to arrive at
a gross employment income total. Once again, histori-
cal information was provided by General Dynamics
management to reflect the average weighted General
Dynamics workers' wage for the years 1950 through
1962.[5] Figure 2 shows graphically the average annual
wage for General Dynamics workers during the period.

An average annual wage increase was computed
from these figures and used to project General Dy-
namics annual average wages for the 1960-1970 period.
The derived annual average wage increase amounted to
$330. From Table 3 it will be noted that starting
with the year 1960, the $330 increase was added to
each subsequent year until the $10,390 estimated
annual General Dynamics workers' wage was reached for
1970. By multiplying the General Dynamics annual aver-
age wage by General Dynamics TFX employment, for each

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[5]Ibid.

Figure 2

GENERAL DYNAMICS ANNUAL AVERAGE WAGE
(Hourly Paid and Salaried Employees)
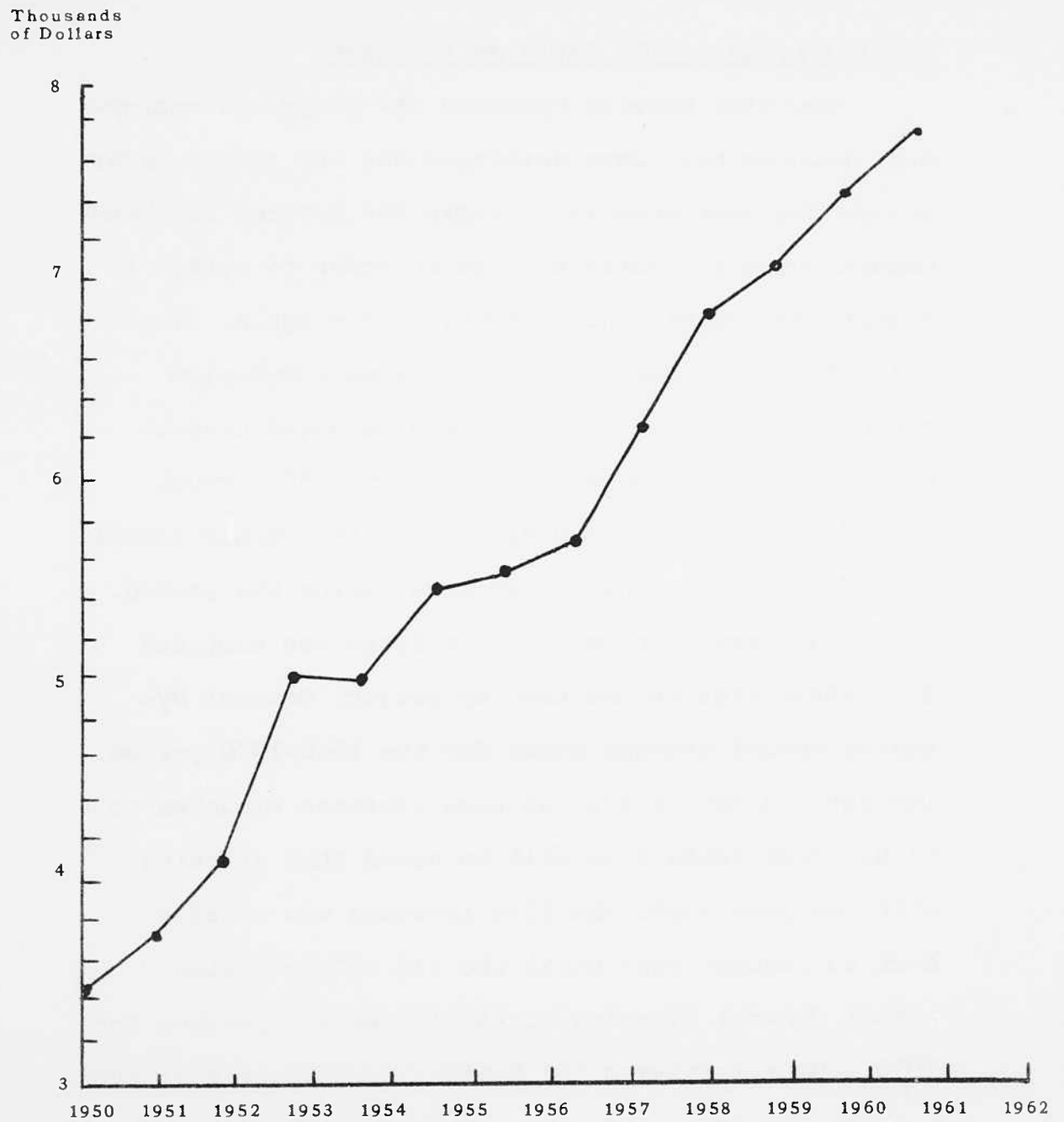
	1960	1961	1962	1963
General Dynamics TFX employment	181	355	873	4,320
General Dynamics annual average wages and salaries	$7,100	$7,420	$7,750	$8,080
General Dynamics TFX gross annual income (in thousands)	$1,285	$2,634	$6,766	$34,906
Federal income plus Social Security tax rate[a]	15%	15%	16%	16%
General Dynmaics TFX disposable annual income (in thousands)	$1,092	$2,239	$5,683	$29,321

[a]Calculated from: U. S. Department of Commerce, Bureau of t
(Washington: U.S. Government Printing Office, p. 389.

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TABLE 3

NERAL DYNAMICS TFX BASIC EMPLOYMENT DISPOSABLE INCOME

1963	1964	1965	1966	1967	1968	1969	1970
4,320	10,400	16,280	17,480	18,720	20,000	18,720	17,480
$8,080	$8,410	$8,740	$9,070	$9,400	$9,730	$10,060	$10,390
$34,906	$87,464	$142,287	$158,544	$175,965	$194,600	$188,323	$181,617
16%	16%	17%	17%	17%	18%	18%	18%
$29,321	$73,470	$118,098	$131,592	$146,051	$159,572	$154,425	$148,926

Bureau of the Census, Statistical Abstract of the United States: 1962
389.

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year during the 1960-1970 period, a total TFX gross
employment income for each year was derived.

To arrive at disposable income, there must be
subtracted from TFX gross employment income that
amount paid to the Federal government for personal
income and social security taxes. A married couple
with two dependents pays personal income and social
security taxes at the rate as shown in Table 3. It
will be observed that the Federal tax rate increases
in accordance with the projected yearly increase to
the annual average workers' wage. The applicable
personal income tax plus the required social security
tax deduction is converted into a total dollar amount
which in turn is deleted from General Dynamics TFX
gross employment income to arrive at General Dynamics
projected TFX disposable employment income.

Since Texas has no personal income tax it was
not necessary to consider this in deriving disposable
income figures.

Table 3 summarizes all pertinent data discussed
and shows the total TFX basic employment gross income
by year derived from projected General Dynamics basic
employment and General Dynamics projected annual aver-
age workers' wages. The table also indicates total
estimated Federal personal income and social security
tax withheld, by percent and by year, after which

total General Dynamics TFX disposable employment in-
come is determined.

The Service-Basic Ratio

The purpose of the service-basic ratio is to
equate employment in the service (dependent) indus-
tries to employment in the basic industries, and to
permit the quantitative expression of this relation-
ship.[6] The service-basic ratio determines that
amount of dependent employment owing its jobs to
basic industry employment. The ratio expresses an
interface relationship but does not necessarily in-
dicate a causal realtionship. A service-basic ratio
can be derived for every basic industrial group or
sub-group. All or portions of agriculture, mining,
and manufacturing production which can be identified
as basic "export" industry creates and supports de-
pendent employment.

General Dynamics/Fort Worth can be broadly
classified in accordance with the 1957 Standard In-
dustrial Classification Manual as falling into the
basic industrial durable manufacturing group. In
keeping with the same S. I. C. coding procedure it can
be further sub-catagorized as transportation equipment,
and broken down even further into a more detailed

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[6]Dale, p. 32.

S. I. C. sub-group identifiable as aircraft and parts.[7]
Through use of the service-basic ratio General Dynamics
aircraft and parts employment can be related to that
amount of service employment it supports. In this re-
search study a General Dynamics service-basic ratio
is developed for the years 1960-1970. Once the ratios
are calculated they can be applied to General Dynamics
TFX employment in order to derive the amount of
service employment it creates and supports in the
Fort Worth trading area for any specific year.

It is assumed that basic industry is the foun-
dation upon which the growth of an economy must de-
pend, and because of the service-basic ratio the
total size of the service industry in the area will
be related to the total size of the basic industry.
The supporting power of the individual basic in-
dustries will differ, and since relationships will be
expressed in terms of employment, the relative im-
portance of each group of basic industrial employ-
ment will be found by weighing basic employment by
average incomes in the different industries. In
other words, a basic industry favored by a high aver-
age industrial wage will support a greater quantity

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[7]Charles M. Tiebout, The Community Economic
Base Study (New York: Committee for Economic Develop-
ment, 1962), p. 31-32.

of dependent employment. Because of this, the aircraft and parts industry can be expected to have a higher than average service-basic ratio than most other manufacturing industries.

The computation of the service-basic ratio for General Dynamics/Fort Worth involves the following steps:

1. Determine the amount of General Dynamics basic employment.

2. Determine the General Dynamics annual average workers wage.

3. Multiplication of (1) and (2) to find General Dynamics basic employment income.

4. Determine total basic employment in the Fort Worth trading area.

5. Develop a Fort Worth basic employment annual weighted average workers wage.

6. Multiplication of (4) and (5) to find the aggregate basic employment income.

7. Determine the total of all dependent (service) employment in the Fort Worth trading area.

8. Divide (3) by (6), and multiply by (7) to determine total number of dependent workers supported by General Dynamics basic employment.

9. Divide the amount of supported service employment found in (8) by the amount of General

Dynamics basic employment to determine the service-basic ratio of General Dynamics.

The foregoing procedure may be illustrated by a specific example based on employment and income statistics previously determined. In Table 4, for the year 1963, it was calculated that 101,150 workers will be engaged in basic employment in the Fort Worth trading area and of these, 18,000 will be employed by General Dynamics.

TABLE 4

BASIC EMPLOYMENT PROJECTED IN FORT WORTH
SUBSEQUENT TO TFX CONTRACT[a]

Year	Total Employment	General Dynamics
1960	99,377	18,066
1961	99,687	17,763
1962	99,997	17,460
1963	101,150	18,000
1964	103,764	20,000
1965	106,377	22,000
1966	107,990	23,000
1967	109,553	24,000
1968	111,217	25,000
1969	110,829	24,000
1970	110,446	23,000

[a]Information extracted from Table 2, Part B.

The projected annual average wage per worker in General Dynamics during 1963 was $8080, as shown in Table 5. The over-all Fort Worth projected basic industry annual average wage for 1963 as shown in Table 5 is $5857. Thus, the 1963 employment income of General Dynamics (step 3) was 18,000 workers multiplied times $8080 which is their annual average wage for that year. The rounded-off result is $145 million.

TABLE 5

PROJECTED WEIGHTED BASIC WORKERS
ANNUAL AVERAGE WAGE[a]

Year	National	Fort Worth	General Dynamics
1960	$4,615	$5,261	$7,100
1961	$4,802	$5,474	$7,420
1962	$4,987	$5,686	$7,750
1963	$5,137	$5,857	$8,080
1964	$5,287	$6,028	$8,410
1965	$5,437	$6,199	$8,740
1966	$5,587	$6,370	$9,070
1967	$5,737	$6,541	$9,400
1968	$5,887	$6,712	$9,730
1969	$6,037	$6,883	$10,060
1970	$6,187	$7,054	$10,390

[a]See page 56 for explanation of table.

The 1963 aggregate employment income for all basic workers in the Fort Worth area was obtained by multiplying 101,150 total basic workers by the projected Fort Worth basic workers annual average wage of $5857 (step 6) to arrive at a total of $592 million. Table 6 shows 181,177 workers employed in the dependent industries for 1963 (step 7). The amount of 1963 service employment supported by the 18,000 General Dynamics workers, calculated in accordance with the procedure outlined in step 8, is therefor:

$$\frac{145}{592} \text{ X } 181,177 = 44,570$$

The ratio of service to basic General Dynamics employment in 1963 is 44,570 to 18,000 or, the equivalent of 2.47:1. This indicates that each basic worker employed by General Dynamics/Fort Worth supports 2.47 service workers. This, and all other projected service-basic ratios subsequent to the TFX contract award for the years 1960 through 1970, is noted in Table 7.

It has been previously indicated that the General Dynamics aircraft and parts workers annual average wage of $8080 used for 1963 in the example was provided from General Dynamics management sources.[8]

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[8]Interview with James S. Hall, General Dynamics representative, Dayton, Ohio, June 24, 1963.

Year	1960	1961	1962	1963
General Dynamics employment subsequent to the TFX contract	18,066	17,763	17,460	18,0
General Dynamics employment prior to the TFX contract	18,066	17,763	17,460	17,1
Increase in General Dynamics employment	—	—	—	8
Service—Basic Ratio	2.33	2.37	2.41	2.
Dependent employment due to TFX hiring	—	—	—	2,0
Dependent employment prior to the TFX contract	171,632	174,136	176,641	179,1
Dependent Employment subsequent to TFX contract	171,632	174,136	176,641	181,1

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TABLE 6

ENDENT EMPLOYMENT CHANGES DUE TO TFX HIRING

2	1963	1964	1965	1966	1967	1968	1969	1970
460	18,000	20,000	22,000	23,000	24,000	25,000	24,000	23,000
460	17,157	16,853	16,550	16,247	15,994	15,640	15,338	15,033
—	843	3,147	5,450	6,753	8,006	9,360	8,662	7,967
1	2.47	2.55	2.63	2.69	2.76	2.84	2.91	2.92
—	2,032	7,773	13,898	17,760	21,536	25,833	24,600	23,183
641	179,145	181,649	184,154	186,658	189,162	191,667	194,171	196,676
641	181,177	189,422	198,052	204,418	210,698	217,500	218,771	219,859

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TABLE 7

PROJECTED SERVICE-BASIC RATIOS
FOR THE FORT WORTH TRADING AREA

Aircraft and Parts Industry Prior to TFX Award

1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
2.28	2.35	2.42	2.49	2.56	2.63	2.70	2.77	2.84	2.91	2.98

General Dynamics Subsequent to TFX Contract

1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
2.33	2.37	2.41	2.47	2.55	2.63	2.69	2.76	2.84	2.91	2.92

The $5857 Fort Worth basic workers' annual average wage, however, was not so easily acquired. It was first necessary to obtain the national basic workers' annual average wage, and with the 1955 through 1962 figures acquired, derive the estimated annual average wage increase of $150.[9] Since national basic annual average wages were provided for the 1960–1962 period, the $150 annual average wage increase was projected only for the years beyond 1963 and up through 1970. See Table 5. The Fort Worth basic workers' annual average wage was provided for the year 1959.[10] By comparing the given Fort Worth 1959 wage figure with the national 1959 equivalent basic workers' annual average wage, it was found that the Fort Worth basic wage rate was 14 percent higher than the national average. It was assumed that the 14 percent wage differential would continue to prevail and accordingly, was applied to the years 1963 through 1970 in Table 5, which accounts for a $171 Fort Worth annual average wage increase per year.

From Table 5 it will be noted that the General Dynamics basic workers' annual average wage is even higher. This can be attributed to the higher skills

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[9]Statistical Abstracts of the United States, 1962, p. 230.

[10]Blair, p. 78.

required of aircraft and parts basic industry employ-
ment as compared to the rest of manufacturing and
other basic industry as a whole. It can also be
attributed to the fact that General Dynamics annual
average wage figures include technical and engineering
salaried personnel (but not executive salaried person-
nel) in its compilation. The higher paid salaried
personnel tend to increase the General Dynamics annual
average wage to a degree greater than the national and
Fort Worth annual average wage figures which are based
on hourly wage rate employment alone.

Dependent employment and income is covered in
more detail later in this chapter. However, it might
be mentioned here that in the service-basic ratio
formula, total dependent employment figures used for
computing the ratio for any one of the projected
years (1960-1970) includes the increase to the number
of dependent workers created by the projected in-
crease in General Dynamics basic employment for that
year. In the 1963 example, an increase of 843 basic
workers results in an increase of 2032 dependent
workers once the 2.41 service-basic ratio for 1962
is applied. The increase of 2032 dependent workers
for the year when added to the 179,145 previously
projected prior to the TFX contract award, will re-
sult in the 181,177 figure used in the service-basic

formula for deriving the ratio for 1963 subsequent to the TFX contract award. A more complete explanation of the procedures concerning the above is provided in the following section to this chapter.

TFX Dependent Employment

As explained in the preceding section, the service-basic ratio is the key device for determining dependent employment. With this in mind, Table 7 was prepared to show projected service-basic ratios for the aircraft and parts industry in the Fort Worth trading area prior to the TFX contract award and for General Dynamics subsequent to the TFX award. The service-basic ratios derived prior to the TFX contract award are based on projected aircraft and parts industry ratios for 1959 and 1980.[11] Results of interpolations made from the two ratios for deriving individual ratios for the intervening years are shown in the table. Projected service-basic ratios shown for General Dynamics subsequent to the TFX contract were individually determined by substituting applicable data for specific years in the service basic ratio formula and arriving at the results mathematically. This procedure was illustrated in the 1963 example in the preceding section of this chapter. These ratios

[11]Blair, p. 79.

are also shown in Table 7. It will be noted that both
the interpolated service-basic ratios and those actual-
ly computed compare very closely for each correspond-
ing year. However, it is the computed ratios based
on information acquired subsequent to the TFX award
that will be used in determining TFX dependent employ-
ment.

In order to determine projected total dependent
employment and projected TFX dependent employment,
Table 8 was devised. The service-basic ratios shown
in this table are those derived subsequent to the TFX
contract award, and are the same as those previously
shown in Table 7. Total dependent employment, by
year, has been determined by multiplying the applicable
service-basic ratio for that year by the total Gener-
al Dynamics basic employment. For 1960 this can be
seen to be 42,094 dependent workers. Total TFX de-
pendent employment, by year, has been determined by
multiplying the applicable service-basic ratio for
that year by the total General Dynamics TFX basic
employment. For 1960 the number of TFX dependent
workers can be seen to be 422 which is one percent
of total General Dynamics dependent employment.[12]

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[12]Projected TFX dependent employment percentages
for the years 1960 through 1970 were originally esti-
mated and provided by General Dynamics management in
an interview conducted on June 24, 1963, Dayton, Ohio.

TABLE 8

PROJECTED DEPENDENT EMPLOYMENT SUPP(

	1960	1961	1962	19
Total General Dynamics basic employment	18,066	17,763	17,460	18,0
TFX General Dynamics basic employment	181	355	873	4,3
Percent of General Dynamics employment working on TFX	1	.2	5	2
Service-Basic ratio	2.33	2.37	2.41	2.
Total dependent employment due to General Dynamics	42,094	42,098	42,079	44,4
Total dependent employment due to TFX	422	841	2,104	10,6

BLE 8

OYMENT SUPPORTED BY GENERAL DYNAMICS

962	1963.	1964	1965	1966	1967	1968	1969	1970
460	18,000	20,000	22,000	23,000	24,000	25,000	24,000	23,000
873	4,320	10,400	16,280	17,480	18,720	20,000	18,720	17,480
5	24	52	74	76	78	80	78	76
2.41	2.47	2.55	2.63	2.69	2.76	2.84	2.91	2.92
,079	44,460	51,000	57,860	61,870	66,240	71,000	69,480	67,160
,104	10,670	26,520	42,816	47,021	51,667	56,800	54,475	51,041

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The year 1968 can be seen to involve 56,800 TFX dependent workers at the TFX employment rate of 80 percent. This is the highest projected amount and rate of TFX dependent employment for any one year of the study. The TFX dependent employmemt figures shown on this table for each year covered are important in that they are the quantities by which dependent annual average workers wages must be multiplied to arrive at TFX gross dependent employ- ment income. This will be described in the next section of this chapter.

TFX Dependent Employment Income

In addition to determining the number of de- pendent employees created by the award of the TFX contract, the annual average wages of these workers had to be found. No established figures were avail- able which showed either the national or the Fort Worth dependent (service) employment annual average wage. In order to compute TFX dependent income for the Fort Worth area, a weighted annual average wage for dependent workers had to be developed.

The Statistical Abstract of the U. S., prepared by the Bureau of the Census, provided dependent employ- ment groups corresponding to the 1957 Standard In- dustrial Classification Code.[13] The five major groups

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[13]Tiebout, pp. 31-32.

were broken down into sub-groups indicating national
dependent employment figures and their annual average
wages. These employment figures and average wages
were weighted by sub-groups and then by the major
groups to arrive at a single weighted dependent work-
ers average wage for the years 1955 through 1960.
The five major groups and their weighted annual
average wage can be seen in Table 9. From the aver-
ages of these years it was found that the average
yearly wage increase came to approximately $125.
This amount was added to the projected dependent
workers annual average wage for each year through
1970. This is also evident in Table 9.

After deriving a national weighted dependent
workers annual average wage, the next step was to
obtain an applicable dependent workers annual aver-
age wage for the Fort Worth trading area. This was
done by adding a 10 percent differential to the
national annual average. The reason for assuming an
average 10 percent increase in dependent wages for
the Fort Worth area was on the premise that since
Fort Worth basic employment was paid at a higher
rate of 14 percent than the national average, it
would logically follow that Fort Worth dependent
employment would also receive a higher annual average

Standard Industrial Classification Code	1960	1961	1962
Transportation and public utilities	$5,356	$5,564	$5,772
Wholesale and re- tail trade	$3,692	$3,822	$3,952
Finance, insurance and real estate	$4,160	$4,297	$4,398
Services and miscellaneous	$2,756	$2,839	$2,922
State and local government	$3,380	$3,515	$3,650
National weighted annual average wage	$3,640	$3,765	$3,890
Fort Worth weighted annual average	$4,004	$4,141	$4,279

[a]In computing the national average wage each number of workers in that group.

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TABLE **9**

TED DEPENDENT WORKERS ANNUAL AVERAGE WAGES[a]

1962	1963	1964	1965	1966	1967	1968	1969	1970
$5,772	$5,980	$6,188	$6,396	$6,604	$6,812	$7,020	$7,228	$7,436
$3,952	$4,082	$4,212	$4,342	$4,472	$4,602	$4,732	$4,862	$4,992
$4,398	$4,517	$4,636	$4,755	$4,874	$4,993	$5,112	$5,231	$5,356
$2,922	$3,005	$3,088	$3,171	$3,254	$3,337	$3,420	$3,503	$3,588
$3,650	$3,785	$3,920	$4,055	$4,190	$4,325	$4,460	$4,595	$4,732
$3,890	$4,014	$4,139	$4,264	$4,389	$4,514	$4,638	$4,763	$4,888
$4,279	$4,415	$4,552	$4,690	$4,827	$4,965	$5,101	$5,239	$5,376

wage each S.I.C. group annual average wage is weighted proportionately to the

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workers' wage.[14] The assumption is that since depend-
ent workers' wage were contingent upon basic employ-
ment and wages, the dependent workers' wages would
not increase at the same rate but at a rate somewhat
less. Therefore, it was arbitrarily assumed that an
increase of 10 percent over national dependent work-
ers wages should approximate actual Fort Worth de-
pendent annual average workers wages.

Now that TFX dependent employment and a weight-
ed dependent employment annual average workers' wage
has been determined, all that remains is to multiply
the two applicable figures to derive a yearly TFX
gross dependent employment income. This is accomplish-
ed in Table 10.

To arrive at disposable income there must be
subtracted from TFX gross dependent employment income
the amount paid to the Federal government for personal
income and social security taxes. A married couple
with two dependents, for instance, pays personal in-
come and social security taxes at the rate shown in
Table 10. In accordance with the applicable income
tax rate plus the required social security tax rate,
a deduction is made to TFX gross dependent employment
income and the resulting figure is the projected TFX

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[14]Supra, p. 56.

	1960	1961	1962	1963
Dependent employment resulting from TFX	422	841	2,104	10,670
Dependent Employees annual average wage	$4,004	$4,141	$4,279	$4,415
Gross dependent employment income (in thousands)	$1,690	$3,483	$9,040	$47,108
Federal Income plus Social Security tax rate[a]	9%	9%	9%	9%
Dependent employment disposable income (in thousands)	$1,538	$3,170	$8,226	$42,868

[a]Calculated from: U. S. Department of Commerce, Bureau
(Washington: U.S. Government Printing Office). p. 389.

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TABLE 10

DEPENDENT EMPLOYMENT DISPOSABLE INCOME

	1963	1964	1965	1966	1967	1968	1969	1970
	10,670	26,520	42,816	47,021	51,667	56,800	54,475	51,041
'9	$4,415	$4,552	$4,690	$4,827	$4,965	$5,101	$5,239	$5,376
:0	$47,108	$120,719	$200,807	$226,970	$256,527	$289,737	$285,395	$274,396
'%	9%	12%	12%	12%	12%	12%	12%	12%
26	$42,868	$106,233	$176,710	$199,734	$225,744	$254,969	$251,148	$241,460

ce, Bureau of the Census, Statistical Abstract of the United States: 1962
389.

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dependent employment disposable income for the appro-
priate year within the 1960-1970 period.

Table 10 summarizes the pertinent data discussed
and shows the total TFX gross dependent employment
income by year derived from projected TFX dependent
employment and projected dependent employment annual
average workers wages. The table also indicates
total estimated Federal income and social security
taxes withheld, by percent and by year, after which
total TFX disposable dependent employment income is
determined.

TFX Net Employment

To this point, this chapter has been concerned
with total General Dynamics TFX basic employment and
income and total TFX dependent employment and income
projected for the 1960-1970 period under study. From
information developed, it will now be determined what
portion of the totals are attributable to new TFX
employment and from that, what the net impact of the
contract award can be expected to be on the Fort Worth
trading area economy for the future years through 1970
covered by the study. It is the new or net TFX employ-
ment that will trigger primary investment of TFX de-
rived income and secondary consumption respending in
the Fort Worth trading area.

Data presented in Table 6 indicates that new
basic employment hiring by General Dynamics first be-
gan in 1963 and is presumed to continue as a result
of the TFX contract award through 1968. Beginning
in 1969 General Dynamics total projected basic em-
ployment will start to decline, and there will be no
new hiring for that year or for the years following.

The first portion of Table 6 indicates that
General Dynamics basic employment projected prior to
the TFX award and projected subsequent to the TFX
award are both equal in amount for the years 1960,
1961 and 1962. Beginning with 1963, however, it will
be seen that General Dynamics projected employment as
a result of the TFX award is boosted upward to 18,000
workers. Since prior to the consideration of the TFX
award only 17,157 basic employees were projected for
1963, there is now created a difference of 843 new
employees of which all, in accordance with the previ-
ous declared assumption, will be new TFX General Dy-
namics basic employment. To determine the quantity
of dependent workers supported by the new TFX basic
employment, it is necessary to apply the 1963 service-
basic ratio of 2.47:1. The 1963 ratio of 2.47:1 has
been accordingly multiplied by the figure of 843 basic
workers for that year and the result will be found to
equal the 2,082 dependent worker figure shown in
Table 12.

The difference between the two General Dynamics
projected basic employment figures for years 1963
through 1968, as shown in Table 6, indicates a yearly
increase of new basic employment as a result of the
TFX contract award. For the years 1969 and 1970,
however, a projected decrease to TFX basic employ-
ment is evident to the extent of 1000 workers per
year. Regardless of this fact, the amount of General
Dynamics basic employment for all years 1963 through
1970 is still in excess to what was projected prior
to the TFX award. Therefore, dependent employment
resulting from that amount of basic employment in
excess to what was projected prior to the TFX award
can still be described as derived from all new Gener-
al Dynamics basic employment hired during the period
under study.

By following the same procedure as described
for 1963, the new increase to TFX dependent employ-
ment for the years 1964 through 1970 has been de-
termined and is shown in Table 12.

TFX Net Employment Income

To TFX net employment figures (new TFX hiring)
as developed, it is possible to apply projected
annual average wages in order to arrive at net TFX
basic and dependent gross employment income totals.
For this purpose Tables 11 and 12 have been prepared.

	1960	1961	1962	196
General Dynamics net TFX employment	–	–	–	84
General Dynamics annual average wage and salaries	$7,100	$7,420	$7,750	$8,08
General Dynamics net TFX employment gross annual income (in thousands)	–	–	–	$6,81
Federal Income plus Social Security tax rate[a]	15%	15%	16%	16
General Dynamics net TFX employment disposable annual income (in thousands)	–	–	–	$5,72

[a]Calculated from: U. S. Department of Commerce, Bureau
(Washington: U.S. Government Printing Office), p. 389.

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TABLE 11

ERAL DYNAMICS NET TFX BASIC EMPLOYMENT DISPOSABLE INCOME

62	1963	1964	1965	1966	1967	1968	1969	1970
—	843	3,147	5,450	6,753	8,006	9,360	8,662	7,967
50	$8,080	$8,410	$8,740	$9,070	$9,400	$9,730	$10,060	$10,390
—	$6,811	$26,466	$47,633	$61,250	$75,256	$91,073	$87,140	$82,777
6%	16%	16%	17%	17%	17%	18%	18%	18%
—	$5,721	$22,231	$39,535	$50,838	$62,462	$74,680	$71,455	$67,877

erce, Bureau of the Census, Statistical Abstract of the United States: 1962
p. 389.

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	1960	1961	1962	1963
Net Dependent Employment resulting from TFX hiring	–	–	–	2,082
Dependent Employment annual average wage	$4,004	$4,141	$4,279	$4,415
Net TFX Dependent Employment gross income (in thousands)	–	–	–	$9,192
Federal Income plus Social Security tax rate[a]	9%	9%	9%	9%
Net Dependnet Employment Disposable income (in thousands)	–	–	–	$8,365

[a]Calculated from: U. S. Department of Commerce, Bu
(Washington: U.S. Government Printing Office). p. 389.

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TABLE 12

T TFX DEPENDENT EMPLOYMENT DISPOSABLE INCOME

2	1963	1964	1965	1966	1967	1968	1969	1970
	2,082	8,025	14,334	18,166	22,097	26,582	25,206	23,264
79	$4,415	$4,552	$4,690	$4,827	$4,965	$5,101	$5,239	$5,376
	$9,192	$36,530	$67,226	$87,687	$109,712	$135,595	$132,054	$125,067
%	9%	12%	12%	12%	12%	12%	12%	12%
	$8,365	$32,146	$59,159	$77,165	$96,547	$119,324	$116,208	$110,059

Commerce, Bureau of the Census, Statistical Abstract of the United States: 1962
. p. 389.

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Projected General Dynamics basic workers annual average wages by year, as previously derived and presented in Table 5, are multiplied in Table 11 by the firm's net TFX employment for the applicable year. As can be seen in the table, General Dynamics net increase in TFX employment over that originally projected prior to the contract award, is carried forward through 1970. The appropriate General Dynamics annual average wage for each year during the 1960-1970 period is multiplied by the applicable net TFX employment figure and the product, as a result, determines General Dynamics net TFX gross annual income by year.

To arrive at disposable income, there must be subtracted from net TFX gross employment income, that amount paid to the Federal government for personal income and social security taxes. As shown previously in this chapter in deriving total General Dynamics TFX gross employment income, the applicable personal income and social security tax deduction is converted into a total dollar amount which in turn is deleted from General Dynamics net TFX gross annual income to arrive at General Dynamics projected net TFX disposable annual income. From figures shown in Table 11 it can be seen that 1968 is the year reflecting the

greatest contribution of General Dynamics net TFX disposable income derived from basic employment to the Fort Worth trading area economy.

Table 12 concerns itself with developing projected net TFX dependent employment income for the 1960-1970 period under study. By applying the service-basic ratio, net TFX dependent employment has been derived from General Dynamics net TFX basic employment and is shown in the table. The applicable dependent employment figures are multiplied in Table 12 by the dependent employment annual average wage, as previously derived and shown in Table 9, to arrive at the appropriate yearly net TFX dependent employment gross income figures. As similarly done in Table 11 for basic employment, Federal personal income and social security taxes must be deducted from the dependent employment gross income figures to arrive at disposable income. This has been done and as a result it can be observed that 1968 is the peak year for net TFX dependent employment disposable income available for spending in the Fort Worth trading area economy.

Summary

This chapter has concerned itself with developing General Dynamics/Fort Worth TFX basic employment projections for the 1960-1970 period. From these

projections TFX dependent employment to be created and supported by Fort Worth TFX basic employment was derived through application of the service-basic ratio. To the total TFX basic and dependent employment figures developed was applied the appropriate annual average wage to arrive at total gross employment income expected by year in the Fort Worth trading area as a result of the TFX contract award. In addition, new TFX basic employment added to the General Dynamics work force beginning in 1963, and how new TFX dependent employment was derived was explained and shown. To the net TFX basic and dependent employment figures developed was applied the appropriate annual average wage to arrive at net gross employment income expected by year in the Fort Worth trading area as a result of the contract award. In both cases, Federal personal income and social security taxes were deleted and disposable income figures derived and shown for each year of the 1960-1970 period.

The net outcome, is that from the presentation given in this chapter one can determine disposable income attributable to total employment created in the Fort Worth trading area due to the TFX contract award or, determine disposable income attributable to net or new employment created in the Fort Worth trading area due to the TFX award.

CHAPTER V

THE MULTIPLIER DOCTRINE

Introduction

This chapter will deal with the theory of determining the multiplier effect for the Fort Worth, Texas trading area. Since the last chapter went into detail on the service-basic ratio, which in itself is a multiplier, a clarification should be made as to the need of the multiplier doctrine.

It should be noted that a multiplier is a measurement of exports, and any additional investment or income into a community due to increased exports will be amplified by the amount of the multiplier. This amplified amount is always greater than the initial investment and this creates new goods and services in the community as a result of the increased exports.

The service-basic ratio, when applied to General Dynamics and the Fort Worth trading area, will show approximately the amount of investment income placed into the community for a specific year and also spent during that year. The multiplier doctrine will be a

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theoretical substantiation for the service-basic ratio. It should be remembered that the service-basic ratio process is a more realistic approach to the problem while the multiplier doctrine is a theoretical approach. Also, the multiplier doctrine is that of measuring an impact and the effects of respending can cover many years, rather than any one specific year as shown in the service-basic ratio. If data were not available to determine the service-basic ratio for a community, the multiplier doctrine could be used, since data for determining the marginal propensity to consume (MPC) is usually more readily available.

Determining the Marginal Propensity to Consume

In order to find the multiplier to be applied, the marginal propensity to consume (MPC) must first be known. The general formula for determining the multiplier is

$$\frac{1}{1-MPC} = \text{Multiplier.}[1]$$

The multiplier is then applied to the extra spending to determine the amplified effect of additional income into the Fort Worth trading area.

For purposes of this research project, the marginal propensity to consume (MPC) was determined

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[1]Paul A. Samuelson, Economics (New York: McGraw-Hill Book Company, Inc., 1961), p. 268.

for the United States since the information necessary for the Fort Worth trading area was not considered sufficient. It is assumed that the national marginal propensity to consume (MPC) will approximate that of the Fort Worth trading area for the period under study.

The assumption that the national marginal propensity to consume will approximate that of the Fort Worth trading area is based upon a six year study of net effective buying income and retail sales for the years 1957 through 1962 in the Fort Worth metropolitan area.[2]

The marginal propensity to consume for the six year period was .683 as compared to the national average of .691 which was compiled over a sixteen year period.

The net effective buying income and retail sales were used in determining the Fort Worth MPC as compared to the net national product and consumption expenditures for the national MPC. The net effective buying income is considered as total cash actually available for spending. That is, it is income less non-cash items such as food and fuel produced and consumed by farmers, imputed rentals of owner-occupied homes, incomes received by trusts, pension and welfare funds and income of non-profit institutions.

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[2]Sales Management Survey of Buying Power (New York: Sales Management, Inc., 1958-1963)

Retail sales takes into account such items as food, general merchandise, apparel, furniture and household appliances, automotive devices, gas station sales, lumber and building hardware, and drugs. This ratio of disposable income to personal consumption within the Fort Worth metropolitan area is a good indicator of the marginal propensity to consume for the entire trading area.

Since the Fort Worth figures are only for a six year period and the national average is over a sixteen year period, it was felt that the national average would be a better indicator of marginal propensity to consume than for the shorter period.

In determining the marginal propensity to consume, the net national product and the consumption expenditures of the United States for a sixteen year period (1946-1961) were tabulated.[3] This information is shown in Table 13. By plotting the tabulated statistics in the form of a scatter diagram, Figure 3, the estimating line which describes the nature of the relationship between the two variables and the point of intercept of the Y axis is determined. In order to mathematically prove the point of the

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[3]U.S., Bureau of the Census, Historical Statistics of the United States: Colonial Times to 1957., p. 139; and U.S., Bureau of the Census, Statistical Abstract of the United States: 1962., pp. 313-315.

intercept of the Y axis and the slope of the estimating (trend) line, the method of least squares was used.[4] The purpose of using the least squares method was to determine the marginal propensity to consume, which is the slope of the estimating line. By determining the marginal propensity to consume, a forecast can be made of the multiplier effect within a designated area at a specified time or to show a trend of future spending.

In order to fit a straight line (trend line) by the method of least squares, as shown in Figure 3, two normal equations must be obtained and solved simultaneously, since there are two constants, or unknowns, to be found. These unknowns are

a = point of intercept on the Y axis

b = slope of the estimating line or marginal propensity to consume. This straight line has been so fitted that the sum of the squares of the Y deviations from it is less than those from any other straight line. A curve fitted in this manner is usually considered by statisticians to be the best with which to estimate the values of one variable when values of the other variables are known.[5]

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[4]Frederick E. Croxton and Dudley J. Cowden, Applied General Statistics (New York: Prentice-Hall, Inc., 1940), p. 655

[5]Ibid.

TABLE 13

COMPUTATION OF VALUES USED IN COMPUTING ESTIMAT
PROPENSITY TO CONSUME IN CONSUMPTION EXPENDI
NATIONAL PRODUCT OF A 16 YEAR PERI
(BILLIONS OF DOLLARS)

Year	Net National Product X	Consumption Expenditures Y	XY
1961	473.4	338.10	160,056.5
1960	460.2	328.50	151,175.7
1959	441.7	313.50	138,472.9
1958	405.9	293.20	119,009.8
1957	402.6	284.76	114,644.3
1956	384.5	269.92	103,784.2
1955	365.5	256.94	93,911.0
1954	334.3	238.03	79,573.4
1953	338.9	232.65	78,845.0
1952	323.0	219.77	70,985.7
1951	307.0	209.81	64,411.6
1950	265.5	190.80	50,657.4
1949	240.8	178.83	43,062.2
1948	244.0	177.45	43,297.8
1947	221.5	165.57	36,673.7
1946	200.0	146.91	29,382.0
Total	5,408.8	3,844.74	1,377,927.8

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TABLE 13

COMPUTATION OF VALUES USED IN COMPUTING ESTIMATED EQUATIONS FOR
PROPENSITY TO CONSUME IN CONSUMPTION EXPENDITURES AND NET
NATIONAL PRODUCT OF A 16 YEAR PERIOD
(BILLIONS OF DOLLARS)

Net National Product X	Consumption Expenditures Y	XY	X^2
473.4	338.10	160,056.54	224,107.56
460.2	328.50	151,175.70	211,784.04
441.7	313.50	138,472.95	195,098.89
405.9	293.20	119,009.88	164,754.81
402.6	284.76	114,644.38	162,086.76
384.5	269.92	103,784.24	147,840.25
365.5	256.94	93,911.00	133,590.25
334.3	238.03	79,573.43	111,756.49
338.9	232.65	78,845.09	114,853.21
323.0	219.77	70,985.71	104,329.00
307.0	209.81	64,411.67	94,249.00
265.5	190.80	50,657.40	70,490.25
240.8	178.83	43,062.26	57,984.64
244.0	177.45	43,297.80	59,536.00
221.5	165.57	36,673.75	49,062.25
200.0	146.91	29,382.00	40,000.00
5,408.8	3,844.74	1,377,927.81	1,941,479.11

2

Figure 3

NET NATIONAL PRODUCT AND CONSUMPTION EXPENDITURES

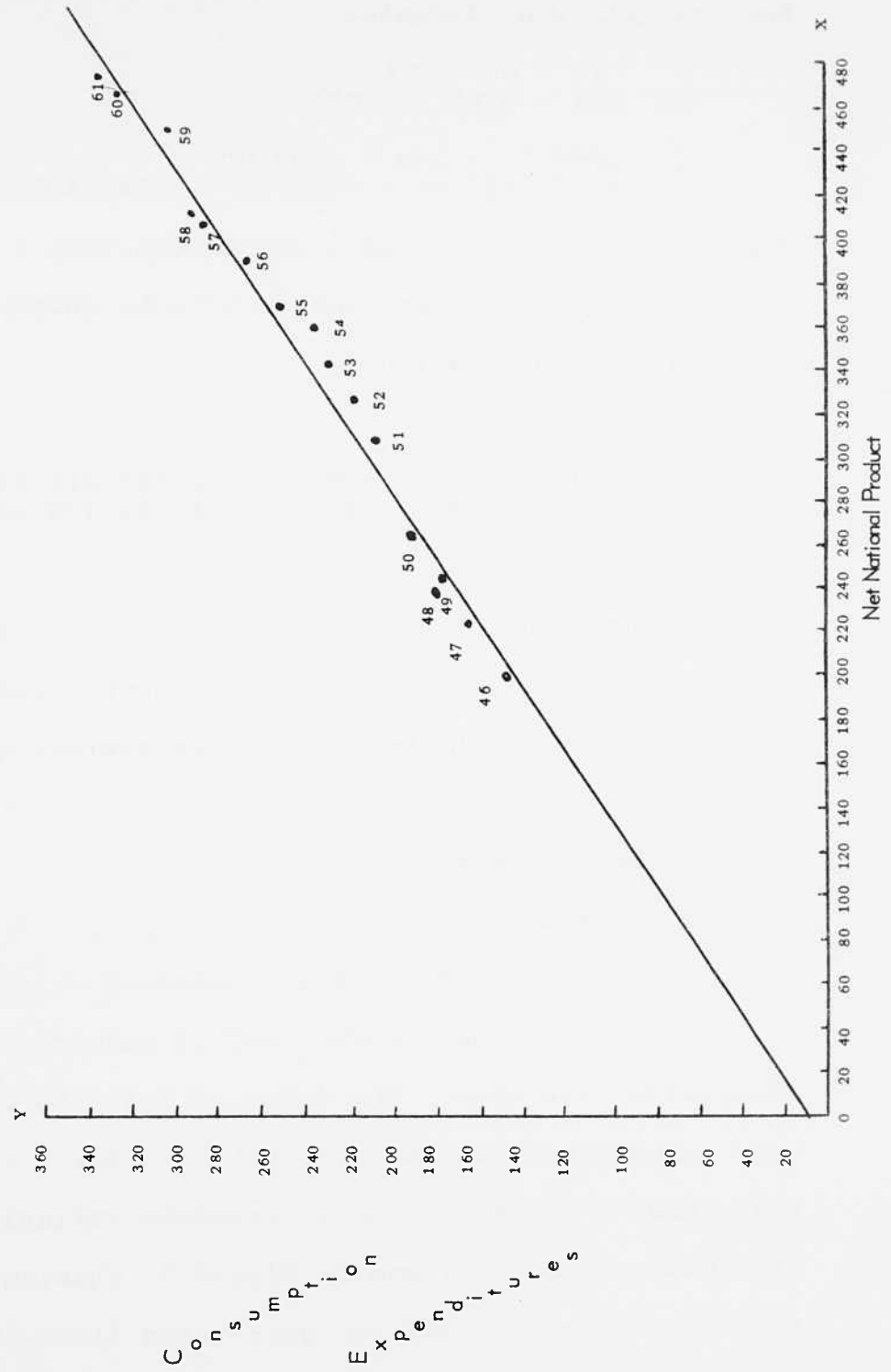FOR THE 16 YEAR PERIOD 1946-1961

(BILLIONS OF DOLLARS)

Table 13 shows the computations that are necessary to determine the values that must be substituted for the following formula:

I $\quad \Sigma Y = Na + b \Sigma X$
II $\quad \Sigma XY = a \Sigma X + b \Sigma X^2$

I $\quad 3844.74 = 16a + 5408.8b$
II $\quad 1,377,927.81 = 5408.8a + 1,941,497.11b$

Multiplication of all the items in equation I by 338.05 permits the cancellation of a by subtracting equation I from equation II.

I $\quad$ x 338.05

I $\quad 1,299,714.36 = 5408.8a + 1,828,411.04b$
II $\quad 1,377,927.81 = 5408.8a + 1,941,479.11b$

$$b = .691$$

To find the value of a, since the value of b is now known, equation I will be computed substituting the value of b. N is the number of observations used in Table 13.

I $\quad \Sigma Y = Na + \Sigma Xb$

$$A = 6.70$$

The values of X and Y are observed values since X is the net national product and is considered an independent variable. The value of Y is the consumption expenditure related directly to X for a specific year, thus Y is considered a dependent variable. This observation is found in Figure 3, showing the relationship of the sixteen year trend (1946-1961) of the net national product and comsumption expenditures in the United States.

Since a = 6.70 and b = .691, the equation of the line will enable one to estimate the consumption expenditures in a designated area when their net product is known and may be stated as

Yc = a + bX.

Yc would be the computed consumption expenditures and X would be the net product for any particular year.

Determining the Multiplier

Now that the marginal propensity to consume (MPC) has been computed, it can now be applied to the multiplier formula. The national marginal propensity to consume (MPC) was calculated to be .691 and the Fort Worth MPC was calculated to be .683. Either MPC can be used to determine the multiplier as rounding off either MPC to the nearest fraction would still result in an MPC of 2/3. Applying the multiplier formula, the multiplier is determined to be 3.

$$\frac{1}{1-2/3} = \frac{1}{1/3} = 3$$

By using the reciprocal of the MPC, or the marginal propensity to save (MPS), the same solution is derived.

$$1.000 \div .309 = 3.23 \text{ or}$$

$$1.000 \div .317 = 3.15 \text{ or rounded off to 3.}$$

It must be remembered that only an indicated multiplier has been calculated for a specific period of time. It is quite probable that if a different period of time had been chosen to tabulate statistics, a different multiplier may have been found. The reason that net national product was used instead of disposable income was to include corporate savings as well as personal savings, as this would show more of the total savings in an economy. The statistics for 1945 were eliminated since this showed the drastic effects of the war years and would not show normal income and expenditures.

The period of time covered in this project is from 1960 to 1970. Fluctuations in the business cycle could change the MPC, thus the multiplier, but it is assumed that the next decade will approximate the last sixteen year period for showing the multiplier effect.

This amplified effect of additional income into a community is called the multiplier doctrine.[6] The word "multiplier" itself is used for the numerical coefficient showing how great an increase in income results from each increase in such investment spending. Any additional income derived from added employment

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[6]Samuelson, p. 266.

due to the award of the TFX contract in the Fort Worth
trading area will be amplified by the multiplier doc-
trine. This not only includes direct (basic) employ-
ment at the General Dynamics plant in Fort Worth, but
also for all additional goods and services procured
within that area as a result of the TFX contract.
Taxes will not be considered as investment spending
within the Fort Worth trading area since General Dy-
namics is a government-owned plant. A recent court
decision ruled that this government-owned plant does
not have to pay local taxes and accordingly, none
have been paid by General Dynamics since 1957.[7]

To illustrate how the multiplier theory will
show a secondary expansion of income and production,
over and above the primary increase of employment
and revenue, the resulting chain reaction takes
place.

If General Dynamics hired 843 new employees
in 1963 due to the TFX contract, as shown in Table
6, with an annual average salary of $8,080, shown
in Table 5, approximately $6,810,000 in new invest-
ment income has been placed into the Fort Worth
economy.[8] This investment income is not to be

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[7]Interview with James Hall, General Dynamics
representative at Dayton, Ohio, June 24, 1963.

[8]Supra, Table 6, p. 54, and Table 5, p. 52.

construed as consumption expenditures. As local income from the export industry (General Dynamics) increases, new plant and equipment, or consumer investment, must be added in order to produce additional needs. Thus, along with a propensity to consume, a propensity to invest in local capital goods would apply. The forecast for 1963 contemplates an increase in the direct export of aircraft from General Dynamics. Some of these inputs will be supplied by local firms which grow with the expanding export market. Other inputs will come from new firms which locate in the community. The remaining inputs will be imported. This investment income of $6,810,000, then, is a measurement of imports of new goods in the community made possible by the export of aircraft.

If all employees have the marginal propensity to consume of 2/3, they will now spend $4,540,000 on new consumption goods. The producers of these goods will now have an extra income of $4,540,000. If their marginal propensity to consume is also 2/3, they in turn will spend $3,026,666, or 2/3 of $4,540,000 (or 2/3 of 2/3 of $6,810,000). So the process will go on, with each new round of spending being 2/3 of the previous round.

Thus the whole endless chain of secondary consumption respending is set up the primary

$6,810,000 of investiment spending. But it is a

dwindling chain, and it all adds up to a finite a-

mount. By geometric progression, the spending is

as follows:

        $6,810,000
            +
        $4,540,000
            +
        $3,026,000
            +
        $2,017,776
            +
        $1,345,184
            +
        ....
        $20,430,000 = $\frac{1}{1-2/3}$ x $6,810,000 or 3 x $6,810,000

This shows that, with an MPC of 2/3, the multi-

plier is 3, consisting of the 1 of primary investment

plus 2 extra of secondary respending.[9]

In conclusion, the multiplier doctrine and the

service-basic ratio can be contrasted to show the

relationship of theory and reality for the projected

economic impact of the TFX contract award due to in-

creased hiring by General Dynamics.

By applying the multiplier doctrine to new

hiring by General Dynamics in 1963, it was found that

approximately $20 million was placed in the Fort Worth

economy, as previously illustrated. It should be re-

membered that the theory of the multiplier is that of

measuring an impact and is not necessarily associated

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[9]Samuelson, p. 267.

with time. The secondary respending could be done within a year or it could take many years to be respent.

The service-basic ratio, when applied to 1963, will give a more realistic picture of what impact General Dynamics hiring will have upon the Fort Worth economy for that specific year. Table 7 shows that the service-basic ratio for General Dynamics in 1963 is 2.47:1. Table 6 shows that General Dynamics will be hiring 843 additional employees in 1963 at an annual wage of $8,080 (Table 5). If the service-basic ratio is 2.47:1, then 843 General Dynamics additional employees will support 2,082 dependent employees at an annual wage of $4,415 (Table 9). By the process of multiplying dependent employees by their wages and adding the new basic income, a realistic figure of investment income and secondary respending is accomplished.

$843 \times 2.47 = 2,082$ dependent employees

$2,082 \times \$4,415 = \$9,192,030$ dependent income

$843 \times \$8,080 = \$6,810,000$ new basic income

This correlation shows that approximately $16 million will be invested and spent in the Fort Worth area during 1963 as compared to approximately $20 million developed by the multiplier doctrine. This difference in investment income will tend to approximate each

other as the service-basic ratio increases yearly, as shown in Table 7.

By repeating the same process as mentioned above for 1970, the multiplier doctrine shows approximately $248 million being invested into the Fort Worth economy as against approximately $208 million from the service-basic ratio. Thus, in 1963, the service-basic ratio income was 80% of the multiplier doctrine income and in 1970 the percentage rose to 84%. This process has not taken into account the additional income that Fort Worth will derive from local procurement created by General Dynamics nor are any leakage factors taken into consideration in this illustration. These factors will be taken into account in a later chapter.

The multiplier doctrine will be used to show the amplified effect of local procurement in Tables 14 and 15, respectively, as shown in Chapter VI. Since the service-basic ratio is applied only to employment, it is not applicable to local procurement income figures and, thus, requires the use of the multiplier doctrine. As previously stated, the multiplier doctrine is a theoretical substantiation of the service-basic ratio and can be used when information needed to derive the service-basic ratio is not available.

CHAPTER VI

SUPPLEMENTAL TFX ECONOMIC FACTORS

Preliminary

Previous chapters have developed and projected
General Dynamics TFX basic employment and income
figures, and projected dependent employment and in-
come figures, by year, for the 1960-1970 period
under study. The income figures then were converted
to total disposable income contributed by TFX basic
and dependent employment to the Fort Worth trading
area. These dollar figures appear in Table 14. It
is the purpose now to discuss income leakage factors,
TFX local procurement, and other various economic
factors which because they are not measurable can
not be incorporated in the TFX impact study.

Dallas TFX Income Leakage

To properly indicate the actual impact of
TFX basic and dependent employment income in the Fort
Worth area, consideration must be taken of that portion
of TFX employment income leakage to outside areas.
General Dynamics has determined from their personnel

89

	1960	1961	1962	1963	
Total General Dynamics (TFX) basic employment disposable income	$1,092	$2,239	$5,683	$29,321	$
Minus Dallas (TFX) export employment income (25%)	$273	$560	$1,421	$7,330	$
Total Adjusted General Dynamics (TFX) basic employment disposable income	$819	$1,679	$4,262	$21,931	$
Total dependent employment (TFX) disposable income	$1,538	$3,170	$8,226	$42,858	$1
Minus Dallas (TFX) export employment income (25%)	$384	$792	$2,056	$10,717	$
Total adjusted (TFX) dependent employment disposable income	$1,154	$2,378	$6,170	$32,151	$
(TFX) local procurement	$100	$200	$500	$2,400	
(TFX) local procurement with multiplier of 3 applied[a]	$300	$600	$1,500	$7,200	$
Impact of TFX award on Fort Worth trading area	$2,273	$4,657	$11,932	$61,342	$1

[a]Local procurement secondary respending would normally
excess of one year. For the purpose of this study, however,
in the year that the initial procurement expense is incurred

1

TABLE 14

THE TFX CONTRACT ON THE FORT WORTH TRADING AREA
   (thousands of dollars)

1963	1964	1965	1966	1967	1968	1969	1970
$29,321	$73,470	$118,098	$131,592	$146,051	$159,572	$154,425	$148,926
$7,330	$18,367	$29,524	$32,898	$36,513	$39,893	$38,606	$37,231
$21,991	$55,103	$88,574	$98,694	$109,538	$119,679	$115,819	$111,695
$42,858	$106,233	$176,710	$199,734	$225,744	$254,969	$251,148	$241,460
$10,717	$26,558	$44,177	$49,933	$56,436	$63,742	$62,787	$60,365
$32,151	$79,675	$132,533	$149,801	$169,308	$191,227	$188,361	$181,095
$2,400	$5,200	$7,400	$7,600	$7,800	$8,000	$7,800	$7,600
$7,200	$15,600	$22,200	$22,800	$23,400	$24,000	$23,400	$22,800
$61,342	$150,378	$243,307	$271,295	$302,246	$334,906	$327,580	$315,590

.d normally be expted to extend over an undeterminable time period in
7, however, the assumption is made that all respending will be accomplished
.s incurred.

records that approximately 25 percent of all General

Dynamics/Fort Worth workers live outside the area

and are residents of the Dallas trading area. This

means that 25 percent of all General Dynamics/Fort

Worth employees commute to work from Dallas and its

surrounding suburbs. General Dynamics has advised

that they anticipate that this current three to one

Fort Worth - Dallas employment ratio will continue

to apply to any new TFX employment hiring.[1]

Because 25 percent of all TFX employees reside

in the Dallas area it is assumed that very little of

their wages are spent in Fort Worth except as necessary

when traveling to and from work. A further rationale,

is that TFX Fort Worth residents doubtlessly do some

shopping in Dallas. This spending in Dallas by TFX

Fort Worth natives is assumed to offset the limited

amount of spending by Dallas TFX commuter employment

while in the Fort Worth area. Therefore, in Table

14 it will be seen that the 25 percent Dallas TFX

commuter employment, converted to disposable income,

is deleted from total General Dynamics TFX basic

employment disposable income. Since General Dy-

namics/Fort Worth basic employment disposable income

is decreased by this income leakage factor of 25

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[1]Interview with James S. Hall, General Dynamics
representative, at Dayton, Ohio, June 24, 1963.

Figure 4

COMBINED FORT WORTH – DALLAS TRADING A
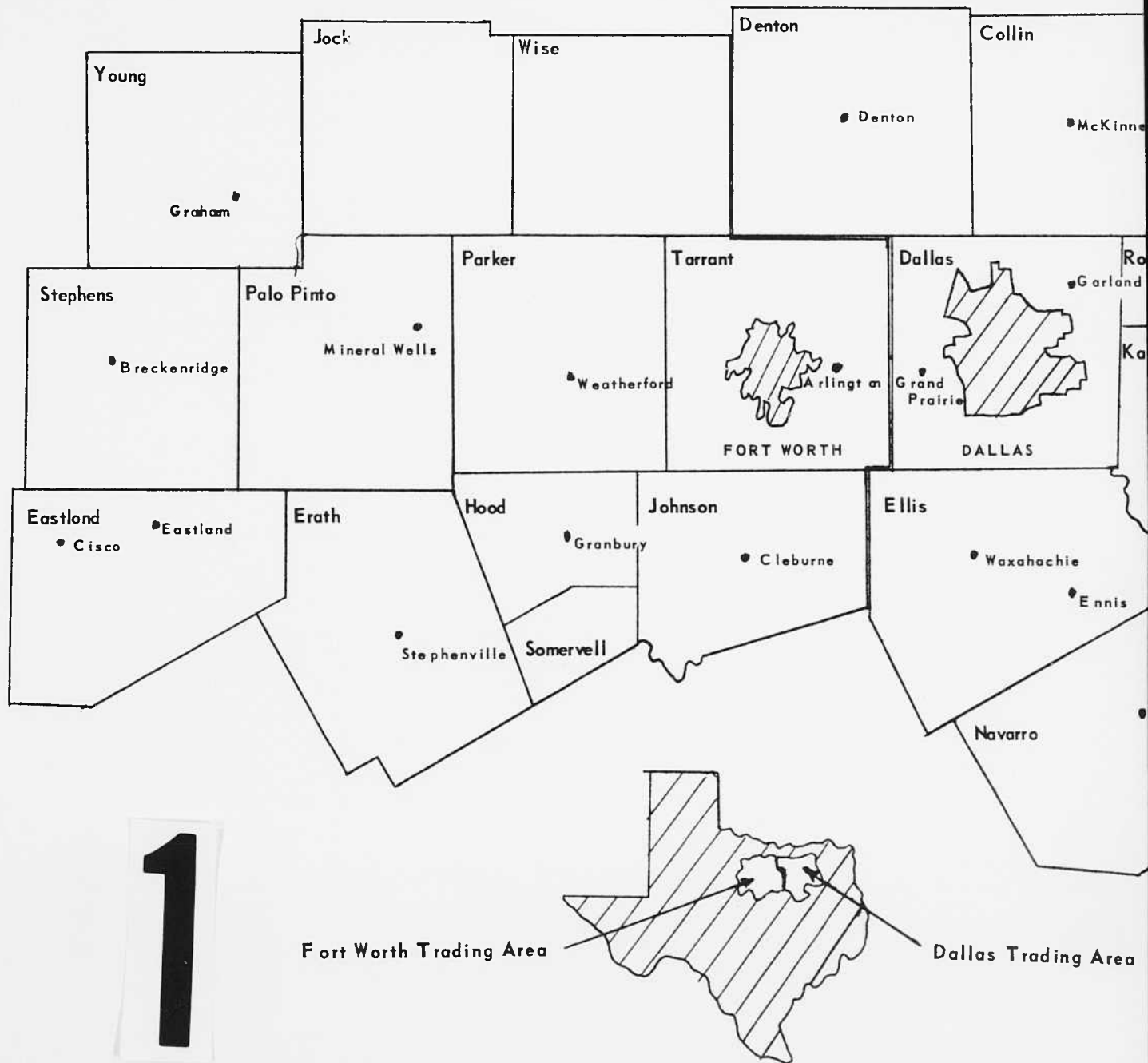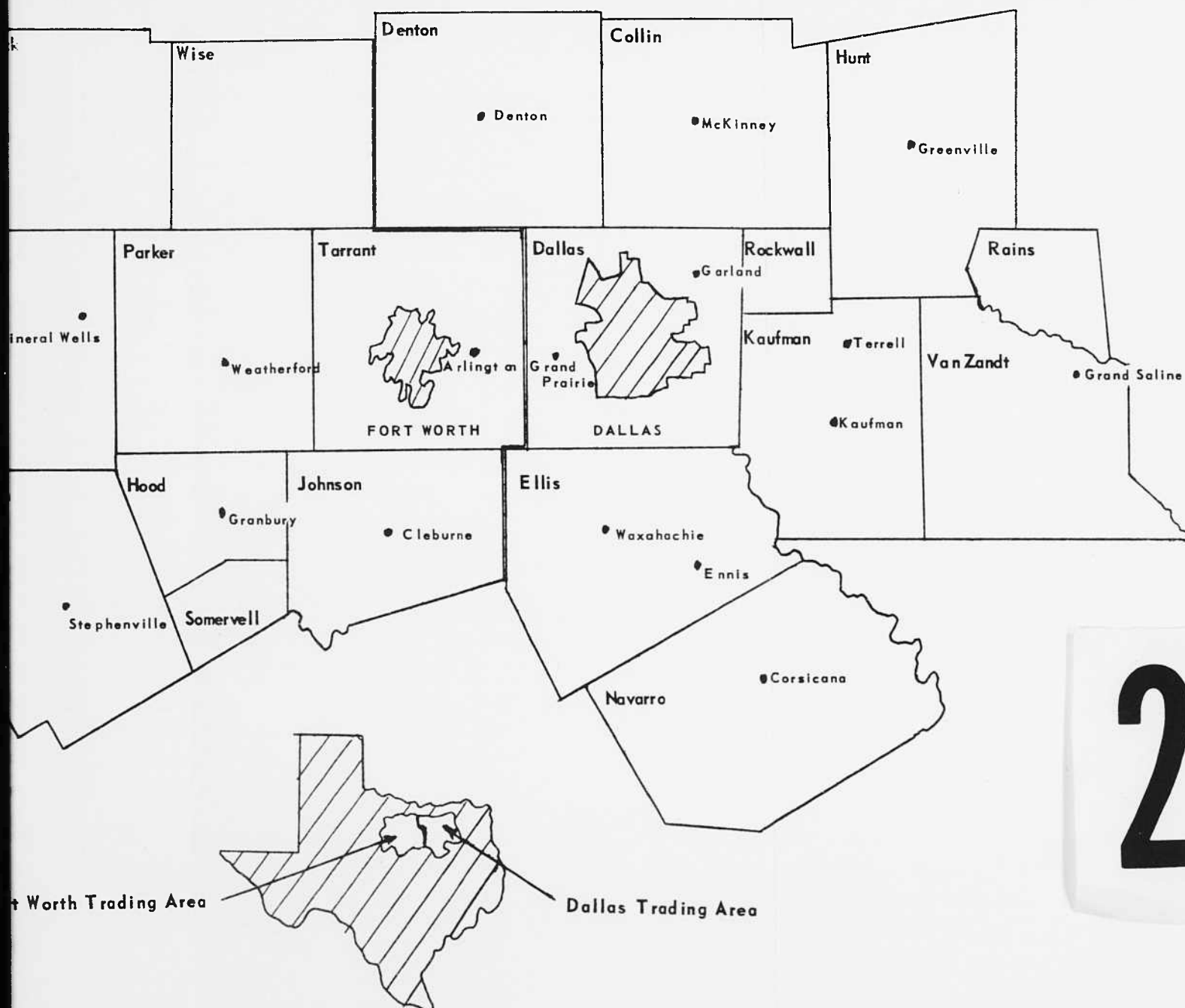

Fort Worth Trading Area

Dallas Trading Area

Figure 4

ED FORT WORTH - DALLAS TRADING AREAS

percent, then it follows that dependent employment
income created by TFX basic employment should also
be decreased by 25 percent. This decrease is also
indicated in Table 14. The net result of the above
is an adjusted General Dynamics TFX basic employ-
ment disposable income figure, and additionally,
an adjusted TFX dependent employment disposable in-
come figure for the Fort Worth trading area. Again,
see Table 14 for the adjusted employment income
figures by years for the 1960-1970 study period.

While it is not the purpose to determine the
impact of the TFX award on the Dallas trading area,
it can never-the-less be seen from the foregoing
that there is an impact which could be measured in
part by the projection of Dallas TFX commuter employ-
ment and income as similarily done for the Fort Worth
trading area.

An additional employment income consideration
is that of dividends and interest received from in-
vestments and savings. Data covering dividend and
interest payments received by General Dynamics TFX
employees was not available and therefore, income
figures appearing in Table 14 are based only on
earned wages.

General Dynamics TFX Local Procurement

An impact factor relative to the Fort Worth
economy as yet unconsidered is that of General Dy-
namics local procurement of goods and services in
support of TFX production. Past local procurement
figures have been provided by General Dynamics which
for the years 1958 through 1962 averaged approximately
$10 million per year. General Dynamics responsible
personnel are of the opinion that $10 million can
still be considered a realistic local procurement
yearly estimate for the years through 1970.[2] With
this as a basis, an assumption was made that General
Dynamics TFX local procurement could be most accurate-
ly projected for the years 1960 through 1970 if Gener-
al Dynamics TFX employment were considered relative.
In other words, the percentage of the estimated
yearly $10 million local procurement figure devoted
to TFX local procurement for any one year will be
assumed to depend directly upon that percentage of
TFX employment relative to total General Dynamics
employment for the corresponding year. In 1963, for
instance, approximately 24 percent of total General
Dynamics employment will be engaged in TFX work.
Since it is assumed that TFX local procurement is

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[2]Ibid.

directly related to TFX employment, then 24 percent
of $10 million, or $2.4 million, can be projected as
the local procurement dollar amount to be spent by
General Dynamics in the Fort Worth area in support
of TFX aircraft production for that year. Local TFX
procurement of $8 million for 1968 is the peak pro-
jected year for the period. All TFX local procure-
ment projections by year for the 1960-1970 period
are presented in Table 14.

Adjusted disposable income and TFX local pro-
curement figures are totaled, as seen in Table 14,
to arrive at the economic impact by year of the TFX
award on the Fort Worth trading area. It will be
noted that the theoretical multiplier of three, as
derived in Chapter V, has been applied to TFX local
procurement figures.

Impact Factors Not Measurable

Certain impact factors, could they have been
measured and included in the study, would have
affected the impact results otherwise derived. One
such factor is that of spending patterns. It has
been assumed that after deducting Federal personal
income and social security taxes and disposable in-
come leakage to the Dallas area, the remaining TFX
workers' disposable income would be spent in the

Fort Worth economy. This is not necessarily the case,
however, as the more income people receive the great-
er will be the tendency to spend more outside the
immediate community on such things as vacations and
clothes buying trips, etc. No way was found to de-
termine what proportion of disposable income of
General Dynamics workers had been spent in past years
outside the Fort Worth area in such a manner and
therefore, it was impossible to estimate what pro-
portion of their spendable income for projected years
would be spent outside the area. Although not measur-
able spending patterns are, however, an additional in-
come leakage factor that if they could be calculated
would reflect a further decrease to Fort Worth dis-
posable income figures.

Despite vacations and buying trip expenditures,
area residents still spend most of their income on
local goods and services creating the sales dollars
for further local consumption of goods and services.
However, not all of what is spent locally is respend-
able income. Part of each dollar paid out is money
spent to bring in merchandise from outside the com-
munity (pay for imports) which may go for wages to
non-residents, and to other such non-local sources.
No way could be found, however, to determine what
portion of disposable income earned by TFX workers

actually remains in the Fort Worth economy for local consumption and respending and what amount leaves the area.

Certain industries, of which the automobile industry is an example, contribute only a small portion of their sales to the local economy. The salesman's commission, and the profit retained by the dealer and which is respent locally as rent, maintenance, advertising, etc. would remain in the Fort Worth area. The larger share of the sales dollar would go to Detroit, however, from where purchases would be made from other various economic areas for steel and other required goods and items needed for automobile production. Meanwhile, the purchase of an equally high priced item but one which is manufactured locally would contribute more to local economic expansion and growth because more of the sales dollar would remain in the community for respending in the form of workers wages, re-investment, and local procurement of required goods and services for support of business operations. It is not always possible to determine what portion of respending remains in the local economy but it can be logically assumed that a larger portion of purchasing power

will be retained by the local economic area when the item purchased is manufactured and consumed locally.[3]

As indicated above, Fort Worth disposable income figures presented in Table 14 would be further reduced if it were possible to measure the leakage of local sales dollars to other economic areas. No accurate estimate can be made, but it is evident that the final yearly TFX dollar impact figures as disclosed in the table are on the optimistic side and would be somewhat lower if all income leakage factors could be computed.

Acceleration Principle

An additional impact factor caused by the TFX award to the Fort Worth trading area is that of investment demand induced by growth of sales and income. The added TFX basic and dependent employment income in the Fort Worth community will increase the demand for consumer goods which will lead to accelerated changes in the level of production of capital goods needed to make the consumer items. The following example is presented as an illustration of how the acceleration principle applies.

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[3]Of course, if the item is manufactured locally and exported for sale, the new outside income thereby derived will have even a greater multiplier effect on the local economy.

Assume that there is a steady consumer demand for 1,000 widgets per year, and that production for this level of demand requires the use of 10 machines, each of which produces 100 widgets. Assume further, as is reasonable, that one widget-making machine wears out and has to be replaced each year. As long as consumer demand stays the same, the demand for widget-making machines will be for one machine per year.

But suppose that for some reason the consumer demand for widgets increases from 1,000 to 1,100 per year, an increase in consumer demand of 10 percent. To produce the additional widgets, the manufactureer will not only have to replace one widget-making machine as scheduled for the year but will also have to buy another one as well. The demand of the manufacturer for widget-producing machines has thus doubled whereas the consumer demand for widgets has increased only 10 percent.

Now, if consumer demand fails to increase further and stabilizes itself at 1,100, the demand for machines will actually decrease -- to 1.1 per year. Thus capital goods industries may expand sharply when consumer demand increases, but they may also contract as a result of the failure of consumer demand to maintain a rate of increase. If consumers merely buy as much as they did before, the capital goods industry will go into a slump. It is as though we have to keep running faster and faster to stay where we are.

Of course, if consumer demand for widgets should fall by 10 percent -- that is, from 1,000 to 900 -- the producer would need only 9 machines for the coming year instead of 10. He would not need to buy any new widget-making machine at all. So a 10 percent decline in consumer demand would have reduced the demand for machines to zero.

The acceleration principle applies also to inventories. Suppose again that consumer demand for widgets is 1,000 per year and that the retailer maintains an inventory equal to sales, that is, an inventory of 1,000. Plainly, then, he must buy 1,000 widgets a year from the manufacturer. But suppose consumer demand increases by 20 percent (that is, from 1,000 to 1,200). In the year of that increase, the retailer would have to buy 1,400 widgets, an increase of 40 percent in his purchasing. He would have to increase his purchasing by that much in order to satisfy the increased consumer demand (200) and to bring his inventory up to the new sales level (up, that is,

by 200). Thus a small increase in consumer de-
mand may bring about a much larger increase in
production. If demand later stabilizes at 1,200,
he will cut his orders from 1,400 to 1,200. The
"acceleration principle" builds up the force of an
expansion, but it also provides a cause for the
downturn; thus when consumer demand is stable or
growing slowly, producers of capital goods or
inventory may suffer.[4]

The acceleration principle is recognized as
contributing to the prosperity of the Fort Worth
trading area only so long as consumption sales con-
tinue to grow at a rate which requires that capital
goods and inventories continue to grow at a rate in
excess of that needed for their replacement. Insofar
as TFX projected income figures indicate, the increas-
ing amount of spendable income available to the
community will be interrupted in 1968. By that date
dis-investment in the capital goods industries will
begin to take affect on the Fort Worth trading area
economy due to the reduction in consumption spending.

Summary

Earlier discussions in this chapter have dealt
with income leakage factors and TFX local procurement
insofar as they effect disposable income contributed
by total TFX basic and dependent employment to the

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[4]Marshall A. Robinson, Herbert C. Morton, and
James D. Calderwood, An Introduction to Economic
Reasoning (Washington, D. C.: The Brookings Institute,
1959), pp.176-178.

Fort Worth trading area economy. It is also of prime importance, however, to show the effect of income leakage factors and TFX local procurement on disposable income contributed by new or net TFX basic and dependent employment. For this purpose Table 15 was devised.

As explained earlier, 25 percent of all General Dynamics/Fort Worth TFX employment commute to work from Dallas. As similarly computed in Table 14, and for the same reasons previously given, it will be seen in Table 15 that the 25 percent Dallas TFX commuter employment has been converted by year to disposable income dollar amounts and deleted from net General Dynamics TFX basic employment disposable income. The result is an appropriately adjusted disposable income figure. The same 25 percent deletion has been made to TFX dependent employment disposable income and a similar adjusted disposable income figure derived.

General Dynamics TFX local procurement figures appearing in Table 15 are the same as previously computed for the 1960-1970 period in Table 14. Procurement figures were based on total General Dynamics basic employment and regardless of the amount of new TFX hiring for any one year will still be spent at the yearly rate derived. This explains why during

	1960	1961	1962	19
Net General Dynamics (TFX) basic employment disposable income	–	–	–	$5,
Minus Dallas (TFX) export employment income (25%)	–	–	–	$1,
Net adjusted General Dynamics (TFX) basic employment disposable income	–	–	–	$4,
Net dependent employment (TFX) disposable income	–	–	–	$8,
Minus Dallas (TFX) export employment income (25%)	–	–	–	$2,
Net adjusted (TFX) dependent employment disposable income	–	–	–	$6,
TFX local procurement	$100	$200	$500	$2,
TFX local procurement with multiplier of 3 applied[a]	$300	$600	$1,500	$7,
Net impact of TFX award on Fort Worth trading area	$300	$600	$1,500	$17,

[a]Local procurement secondary respending would
excess of one year. For the purpose of this study,
in the year that the initial procurement expense is

TABLE 15

PACT OF THE TFX CONTRACT ON THE FORT WORTH TRADING AREA
(thousands of dollars)

962	1963	1964	1965	1966	1967	1968	1969	1970
-	$5,721	$22,231	$39,535	$50,838	$62,462	$74,680	$71,455	$67,877
-	$1,430	$5,558	$9,884	$12,709	$15,615	$18,670	$17,864	$16,969
-	$4,291	$16,673	$29,651	$38,129	$46,847	$56,010	$53,591	$50,908
-	$8,365	$32,146	$59,159	$77,165	$96,547	$119,324	$116,208	$110,059
-	$2,091	$8,036	$14,790	$19,291	$24,137	$29,831	$29,052	$27,515
-	$6,274	$24,110	$44,369	$57,874	$72,410	$89,493	$87,156	$82,544
$500	$2,400	$5,200	$7,400	$7,600	$7,800	$8,000	$7,800	$7,600
,500	$7,200	$15,600	$22,200	$22,800	$23,400	$24,000	$23,400	$22,800
,500	$17,765	$56,383	$96,220	$118,803	$142,657	$169,503	$164,147	$156,252

ding would normally be expected to extend over an undeterminable time period in
his study, however, the assumption is made that all respending will be accomplished
expense is incurred.

1960, 1961 and 1962 there is shown in Table 15 a net impact figure even though no new TFX hiring had yet taken place.

Adjusted General Dynamics TFX basic employment disposable income and adjusted TFX dependent employment disposable income have already had the multiplier incorporated in their computation. However, the theoretical multiplier of three as previously derived in Chapter V must be applied to the TFX local procurement yearly totals in Table 15 to allow for primary investment and secondary respending. The net disposable income figures and the adjusted local procurement figure are totaled to arrive at the net economic impact by year of the TFX award on the Fort Worth trading area.

Other impact factors, not included in the study, were mentioned earlier in the chapter. These factors, such as spending patterns etc., could not be measured and their possible impact on the Fort Worth trading area economy can not be determined. However, as indicated in the discussion of total disposable income, these same impact factors can be expected to similarly effect net disposable income totals. Also, the accelerator principle while recognized as an important factor, once again cannot be directly

applied to <u>net</u> basic and dependent disposable income or its effect measured with respect to the Fort Worth trading area economy.

CHAPTER VII

AN ECONOMIC IMPACT OF THE TFX CONTRACT

Previous chapters in this thesis have adapted
various aspects of economic base study concepts to
the military aircraft and parts industry to determine
the impact of the TFX contract award on the Fort
Worth trading area. In order to determine the im-
pact of the TFX award, it was decided to base the
study primarily on employment and income projected
statistics as they were the most easily obtainable
and probably the most appropriate unit of measure-
ment. This same employment multiplier methodology
used can be applied to other Air Force and DOD
contract economic impact studies. Its application
is also valid in determining the impact on those
communities or areas that have, or are about to have
contracts suddenly terminated.

General Dynamics TFX basic employment in Fort
Worth was projected for the 1960-1970 period. By
applying the service-basic ratio, dependent employ-
ment was derived. In the peak year of 1968, for
instance, 20,000 General Dynamics employees were

estimated to be engaged in TFX aircraft production.
Of this number, 9,360 are new employees due to the
contract award. By applying the service-basic ratio
for 1968, it was found that 9,360 workers will
support 26,582 service workers. If so desired,
net TFX employment and total TFX employment figures
can be computed for all years within the 1960-1970
period to indicate for any one year the number of
jobs created and supported by the TFX contract award.

The economic impact of the TFX contract on the
Fort Worth trading area can be measured in either one
of two ways. First would be the total impact which
would include all General Dynamic employees working
on the TFX contract, plus their related dependent
employment and local procurement. The second method
would consider the net impact which would include
only the increase in new hiring at General Dynamics
resulting from the TFX contract, plus the related de-
pendent employment and local procurement.

The first method of measuring the total impact,
as shown in Table 14, includes and takes into account
the General Dynamics employees who were transferred
from other assignments within General Dynamics to
the TFX contract. In accordance with accepted employ-
ment projections, as previously provided by the Blair
economic base study, these employees would be working
with General Dynamics even though the TFX contract had

not been awarded to that concern. However, to show
the total effect of the TFX contract on the Fort Worth
area, all employment on the TFX contract was taken into
consideration. The service-basic ratio was applied
to the total TFX basic employment to derive total
TFX dependent employment. These figures were then
converted to basic and dependent disposable income,
as shown in Table 14. Also, the multiplier of 3 was
applied to TFX local procurement which was then com-
bined with basic and dependent disposable incomes to
arrive at the yearly total impact of the TFX contract.
The total dollar impact is graphically shown in Table
14. For the eleven year period under study (1960-
1970), a total of more than $2 Billion was placed
into the Fort Worth economy from all aspects of the
TFX contract.

The second method of measuring the economic
impact of the TFX contract would be to consider the
net effect. This would take into account only the
new hiring at General Dynamics that resulted from
the TFX contract. Since there was no new hiring
at General Dynamics for performance on the TFX con-
tract in 1960, 1961 and 1962, the only dollar impact
attributed to the TFX award for those three years
was the previously determined TFX local procurement
figures. The first hiring of new employees for the

TFX award begins in 1963. To the new basic hiring figures are applied the service-basic ratios to derive dependent employment and with the inclusion of local procurement, a yearly net impact of the TFX contract is determined. These results are shown in Table 15. For the eleven year period under study, the net effect of the impact of the TFX contract is approximately $924 million. The contrast between the total impact of the TFX contract and the net impact of the TFX contract is shown by year in Table 14 and Table 15, respectively.

The most valid and pertinent TFX impact indicated by this study is that which is illustrated in Table 15, reflecting disposable income contributed to the trading area as a result of new TFX hiring. Prior to new hiring, all TFX positions were being filled by personnel already holding jobs with General Dynamics/Fort Worth in other capacities. As the B-58 and other programs were phased out, the workers made available moved into newly created TFX jobs. While these jobs were newly created by the TFX award, they did not require additional people from outside General Dynamics to fill them. They were filled from within the company. Beginning in 1963, however, the TFX program required new workers in numbers above what could be provided from within the General Dynamics/

Fort Worth plant. This new hiring and what it is
estimated to contribute to the Fort Worth trading
area is disposable income over and above that which
would be otherwise expected had the TFX award never
been made.

The amount of disposable income anticipated
to be available for spending during the 1960-1970
period as a result of the TFX contract award will
have an obviously marked effect on the Fort Worth
trading area. Not only will more money be avail-
able for spending but the increase in General Dy-
namics TFX and other job opportunities in the ex-
panding economy will entice outsiders to immigrate
to Fort Worth for employment. The new TFX hiring
peak, expected to reach 9,360 by 1968, will in great
part be drawn from outside the Fort Worth trading
area and will swell the total Fort Worth labor
force appreciably. The influx of new workers into
Fort Worth will cause greater demands for housing
and other required necessities. Not only will
existing land and housing values and rents increase,
but because of greater demand new housing starts
will also increase, creating more construction and
related employment. Increased volumes of disposable
income in the area will enhance retail trade.
Merchants will most likely need additional sales

and other personnel to keep up with the increased
sales volume. Inventories will be enlarged to in-
sure that stock will be on hand for sales as required.
Laundries, movie theatres, hotels and motels, and
other miscellaneous service industries will also
be affected by the increase in population and dis-
posable income. Local government will receive an
increase in tax and other revenues. Even something
so simple as receipts from parking meters will in
its small way contribute to Fort Worth municiple
revenues for subsequent respending for such things
as street and sewer construction and improvement and
other public projects. Public utilities and public
and private transportation facilities will have to
be revitalized and expanded to handle the increase
in traffic. Even agriculture, especially truck
farming and dairy production, will benefit locally
from the increase in trading area population and in-
come. Banks and other financial institutions will
increase their deposits and thereby have larger sums
from which to provide reinvestment funds and to float
loans.

Because of the increase in employment and in-
come in the community, people will have more money
for leisure and cultural pursuits heretofor not
provided by the community. Increased interest and

participation will cause municipal and private sponsor-
ship of dramatic and music groups, possible construction
of, or expansion to, auditoriums, libraries and other
educational and leisure facilities. The equivalent
of a Disneyland is already in operation midway be-
tween Fort Worth and Dallas which, while not neces-
sarily attributable to the TFX contract award, does
indicate the type of enterprise that appears in a
prosperous and expanding economy, such as evidenced
by both the Fort Worth and Dallas trading areas.
An increased area population and income will cause
an expansion in hospital and health facilities. Ad-
ditional private as well as public educational insti-
tutions may also be a result.

The growth in the Fort Worth economy will en-
courage import substitutions. That is, those products
previously imported for local consumption that will,
in many instances, now be produced locally. Former
import industry if relocated in the Fort Worth trad-
ing area will create new employment and contribute
additional income. In addition, if some part of
production is for export, then additional income
will be derived from export sales which will be re-
invested or respent in the local area.

New supporting industrial facilities may be
created in the area due to expansion of General

Dynamics production. Those firms supplying needed goods and services to General Dynamics/Fort Worth TFX operations might have previously felt it unprofitable to have a plant locally because of inadequate total sales volume in the trading area. An increase in General Dynamics production as a result of the TFX award, however, might be the deciding factor in a firm's decision to move or expand into the Fort Worth trading area. There can be little doubt that industrial development provides the most effective and rapid leverage on the total local economy, and there can be few communities which do not desire, or have not at some time endeavored to induce new industrial enterprises to locate with them or to encourage the expansion of existing industry.

An additional and oftentimes underrated impact on the local economy in times of anticipated economic expansion and growth is that of individual attitudes. Proper mental attitudes and forward looking, optimistic thinking goes a long way toward inducing and encouraging community expansion and growth. Faith and confidence in the future and in the community is always necessary. The psychological effect created by the TFX award was just enough of a prod to incite this type of thinking among the Fort Worth community and

business leaders to help make possible maximum trading area expansion and growth.

The net economic impact on the Fort Worth trading area as a result of the TFX contract award can be expressed and summarized as contributing over the eleven year period (1960-1970), $924 Million of primary investment plus secondary consumption respending. The breakdown of this net dollar impact figure indicates General Dynamics TFX basic employment will contribute approximately $296 Million to the Fort Worth trading area during the 1960-1970 period. For the eleven year period, dependent employment will contribute approximately $464 Million to the Fort Worth trading area economy. During the same period the $54.6 Million TFX local procurement figure with the multiplier of 3 applied, will result in a primary investment and secondary respending total of approximately $164 Million. By combining basic and dependent employment disposable income figures in which the multiplier effect is already included with the amplified TFX local procurement figure, a net TFX economic impact on the Fort Worth trading area is shown to be $924 Million.

To conclude, the value of an economic impact study to the Air Force and the Department of Defense

is that it shows how and to what extent defense contracts contribute to the growth and prosperity of limited area economies. It also identifies depressed or labor surplus areas created by cutbacks or terminations of defense contracts and thereby indicates availability of unemployed skills by specific geographic areas that might influence future military contract awards. Finally, Air Force and Department of Defense sponsored impact studies can also help forecast defense employment requirements and opportunities for future periods for which local communities can prepare and provide trained personnel.

APPENDIX

NEW SOURCE SELECTION POLICY ON MAJOR WEAPON SYSTEMS RESULTING FROM TFX CONTRACT AWARD

Deputy Secretary of Defense Roswell Gilpatric announced that the Defense Department was initiating a new source selection policy on major items of procurement, with final selection authority resting with the Secretary of Defense.

Gilpatric described the new policy as "an extension and perfection of the present procedure" for evaluating and selecting the sole contractor for a major new weapon procurement. He specified that it would not downgrade the present weight given to military boards in the evaluation process.

The subcommittee of the 21-member Defense Industry Advisory Council who participated, in an advisory capacity, in the drafting of the new source selection policy was appointed last year. Defense Secretary Robert McNamara will take over chairmanship of the council from Gilpatric when Gilpatric leaves his government post in the summer of 1963.

Action will be taken shortly by the Defense Department in five other areas considered by the

Council at its third meeting in May, 1963, Gilpatric

reported.   These are:

1.   Classified briefings of industry on future
research and development plans will be brought under
closer coordination by the Secretary of Defense.
2.   New rules will be issued relaxing management
controls under incentive type contracts.
3.   Regulations establishing a system of "weight-
ed guidelines" for profits or fees on non-competitive
negotiated contracts will be issued.   They will be
based on a study by Logistics Management Institute
last fall.
4.   Defense Department's long-standing policy
of banning systems engineering contractors from
entering into competition for production will be
written out.
5.   Records of contractor performance will be
established, probably in early June of 1963.[1]

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[1]"DOD Plans New Selection Policy", Aviation
Week & Space Technology, (May 13, 1963), p. 29.

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This report represents the work of students of the School of Systems and Logistics. Material included in the report has been developed by the students as a portion of their educational program during attendance at the School.

These students have had considerable experience in various areas of military logistics. Consequently, the opportunity for them to concentrate this experience on the study of specific Air Force or Department of Defense current problems offers a potential not readily found elsewhere in the Air Force. The conclusions, and any recommendations, reached by the students may well be of significance for the military services. It is with this thought in mind that the individual studies are published.

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